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ABSTRACT

Results are presented of a federally funded project that identified new communication aids, software, and assistive technologies that can be used in special education with students who are limited English proficient. The research was conducted in learning centers that use the Comprehensive Competencies Program (CCP) English-as-a-Second-Language (ESL) curricula and materials. The CCP ESL Program served as the core curriculum for the project sites, which included special education classes, a middle school, a high school, and an adult education and employment program. Report contents cover: project activities; program operations at four sites in Texas, Massachusetts, and Virginia; program evaluation results; case studies of 19 student participants; a plan for disseminating and marketing the project's outputs; suggestions to improve the CCP ESL curricula and materials; and suggestions for future research and development. For each of the program sites, information is included on hardware configurations, classroom staffing, software usage, and instructional patterns. Information is also provided on 13 computer-based instructional tools, including their strengths and weaknesses for meeting the needs of non-English-speaking or limited-English-speaking adults with handicapping conditions. Appendices include: a literature review, the interview/observation log, information on learning problems of project participants, and other project results. (Contains 55 references.) (SW)

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FACILITATING THE USE OF
ASSISTIVE TECHNOLOGY BY SPECIAL
EDUCATION STUDENTS WITH
LIMITED ENGLISH PROFICIENCY

GRANT NO. H180P00007

FINAL REPORT

EDUCATION **TURNKEY** SYSTEMS^{INC.}

256 NORTH WASHINGTON STREET
FALLS CHURCH, VIRGINIA 22046

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FINAL REPORT

Submitted to:

**Office of Special Education Programs
U. S. Department of Education
Washington, D. C.**

EDUCATIONTURNKEYSYSTEMS^{INC}

256 NORTH WASHINGTON STREET
FALLS CHURCH, VIRGINIA 22046

November 30, 1992

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I. INTRODUCTION

The 1990 Annual Report to Congress on the Education of the Handicapped Act reported, for the first time, a priority need for new and creative instructional materials and the increased use of technology to serve LEP populations, particularly in early childhood and transition programs. A review of a 1990 detailed bibliography (covering 30 pages of titles) that focused on research on technology use in special education included no project titles related to research on the use of technology in special education with limited English proficient students.

The goals of this project were to compile the limited knowledge and research base on ways of using technology to provide access to education opportunities for this population and to develop and to test, in operational settings, prototypical configurations of hardware, software, and assistive technology in an attempt to identify the potential benefits of technology to compensate for disabilities among LEP populations.

The research was conducted in existing learning centers that use the *Comprehensive Competencies Program (CCP) English as a Second Language (ESL)* curricula and materials. The CCP ESL program covers academic and functional ESL literacy subjects and uses a variety of technologies. Developed by the Remediation and Training Institute with support from the Ford Foundation, it is distributed by U. S. BASICS, a not-for-profit Alexandria, Virginia organization. More than 80 schools and community organizations are now using CCP ESL to serve learners of varied language background with outstanding success. A recent study of 30 demonstration sites using this program showed an average learning gain increase of over 25 percentage points on mastery tests over the last two quarters of 1990.

This exploratory research project has identified new, promising communication aids, software, and assistive technologies that can be used in special education. We believe that a number of products currently under development, including some which use multimedia formats and the new functionality of

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hardware platforms, offer great potential for LEP students who have learning and other disabilities.

This final report presents: (a) a detailed description of project activities for the duration of the project; (b) discussions of program operations at each of the project sites; (c) results of the project's analysis function; (d) case studies of selected student participants in the project; (e) a plan for disseminating and marketing the project's outputs; and (f) suggests enhancement to the CCP/ESL program; and (g) suggestions for future research and development.

II. PROJECT ACTIVITIES

The objectives of this project, as stated in our original application, were:

- a. to compile the limited knowledge base -- fragmented among school- and nonschool-based programs -- on current and potential uses of technology to provide access to educational opportunities for disabled individuals with limited English proficiency;
- b. to adapt and demonstrate, in operational settings, current and emerging hardware, software, and assistive technology in an attempt to identify the potential benefits of technology to compensate for disabilities with LEP populations; and
- c. to select and adapt communication aids and other assistive technology (and supplemental software) for use in conjunction with U. S. BASICS' ESL Center educational software and hardware, with various age populations.

In order to achieve these objectives, we outlined -- in our original application -- a series of tasks. In this chapter we describe in greater detail the activities conducted as part of each of these and other tasks.

TASK 1: COMPILE EXISTING RESEARCH

The current base of research and published literature on the use of technology with disabled LEP populations is extremely sparse. Our literature search included traditional literature sources, as well as personal contacts with key R&D personnel and companies in the field. Traditional sources included: the Council for Exceptional Children; the Special Education Technology Center; the Special Information Group on Cultural Diversity; the National Clearinghouse on Bilingual Education; the National Clearinghouse on Literacy Education; the Bilingual Evaluation Assistance Center; and the Center for Applied Linguistics. From these groups we received bibliographies and recent articles, as well as leads to other sources.

A letter was also sent to all current directors of OSEP-sponsored projects, as well as other ED-funded projects. Many of these letters resulted in telephone follow-ups or subsequent discussions at TAM and other conferences. Discussions with developers (e.g., Hasselbring, Lacefield, Mulligan, Bogo) were most beneficial.

We conducted literature searches through ERIC and such appropriate journals as CALICO, CAELL Journal, CEC and related publications for special populations, and NABE and related publications for bilingual and LEP populations. In addition, we examined programs for presentations and papers from conferences and seminars in the fields of special education, bilingual and ESL/ESOL, technology, and special populations.

The resulting literature review is summarized in Appendix A. Plans for submitting a summary of these findings to journals for publication are now being developed. A copy of the literature review will also be sent to the Center for Improving the Quality of Media, Materials and Technology for dissemination.

TASK 2: IDENTIFY TECHNOLOGIES/POPULATION NEEDS

The second major project task was to identify the specific needs of the study populations and gather the assistive devices which were to be part of the study.

SUBTASK 2.1: IDENTIFY APPROPRIATE POPULATIONS/NEEDS

After identifying the participating sites, we conducted a preliminary assessment of needs for assistive technology and supplemental software. Each of the sites was asked to identify LEP students with various disabilities who would be available for participation in this exploratory research project. The following were identified in the spring of 1991:

Hillsboro (Texas)

- Learning Disabilities - 15
- Emotional Disability - 1
- Mentally Retarded - 2
- Speech Handicapped - 6
- Physically Handicapped - 1

Burncoat Middle School Worcester (Massachusetts)

- Learning Disabilities/
Developmentally Delayed - 14

Arlington (Virginia)

- Learning Disabilities - 10
- Sight Impaired - 4
- Speech Impaired - 5

South High Community School Worcester (Massachusetts)

- Learning Disabilities/
Developmentally Delayed - 24
- Deaf - 1
- Physically Handicapped - 2

As anticipated, the number and types of participants actually involved in Phase II demonstrations and field-testing differed somewhat from those projected in the spring of 1991. Below we summarize the number and characteristics of these participants at each of the sites in October 1991.

- Hillsboro: The Hillsboro site identified 26 potential participants at the beginning of the school year. About half of these were adult dropouts who were attending basic education classes offered at night. These learners had been in special education classes while in school; however, they could not be definitively diagnosed and monitored because no state-approved diagnostician was available to serve the night program. Accordingly, these learners were not used as project participants, although they used project materials and equipment in their studies. The 13 project participants were school-aged children (ranging from ages 14 to 18) who were enrolled in special education or had previously been in special education and were still being monitored. All of these participants had been diagnosed as learning disabled, indicating problems in reading/reasoning, oral expression, listening, and comprehension/retention. All were limited English proficient learners of Hispanic origin, with Spanish the dominant language spoken in their homes. Seven were females and six were males. Of these participants, ten participated in the project during the entire school year, with the other three dropping out during the year before post-testing (although one of these has reportedly returned to the program for the 1992-93 school year).
- Arlington REEP Project: The REEP Project had the largest number of adult participants. Of the more than 100 enrolled participants in the adult literacy program at the Wilson School, 12 were selected for study and observation in the project. Virtually all of these participants had low levels of functional literacy in their native language. All had at least one disability, primarily learning disabilities, and one had a severe sight impairment. Five males and seven females were included, with ages ranging from 23 to 56. Most participants were Hispanic, while the remainder were Middle Eastern, European, and Asian. Of the 12 participants, three dropped out during the course of the project without post-testing; three others dropped out after post-testing during the project, so that a total of nine participants were both pre- and post-tested.
- Burncoat Middle School: These participants were school children, ages 13 and 14. Fifteen participants began the program; two of the participants dropped out during the school year before post-testing, while one other participant dropped out later in the school year after having taken one post-test. All of the 13 participants with pre- and post-test scores were limited English proficient learners of Hispanic origin, with Spanish their dominant language. Seven were males and six were females, and all participants were characterized as "moderate learning disabled".
- South High School: At the beginning of the school year, a total of 18 potential participants ranging from age 15 to 20 were identified at this

site. Four students dropped out or were transferred before beginning participation in the project.; three other participants moved or quit school after spending less than ten hours each in the project. A total of 11 students participants in the entire project during the school year. Of these participants, most were characterized as severely learning disabled. Two participants were physically disabled: one was paraplegic and wheelchair-bound, and the other had both a visual disability and cerebral palsy but was able to walk with crutches. All of the participants were limited English proficient; the majority were of Hispanic origin with Spanish their dominant language, although three of the participants were of Asian (Vietnamese), African (Liberian), or European (Italian) origin. Six were males and five were females.

SUBTASK 2.2: IDENTIFY/OBTAIN TECHNOLOGIES

The process for identifying specific assistive technologies for use with the participants included the following steps:

- identifying assistive technology and software which will compensate for the disabilities of the participants identified to date;
- a careful review of the existing U. S. BASICS' ESL Center program and its components (both current and planned upgrades) to identify areas where alternatives or enhancements are likely to be required; and
- identification of developers and vendors of assistive technology and related programs that could be used to meet the needs of participants and enhance the offerings of the ESL Center for special populations.

Project staff reviewed the existing ESL Center program, as well as anticipated component upgrades. Site staff familiar with the ESL Centers helped to identify areas possibly needing program enhancement. Some of the areas in which such enhancements were made included:

- lower-level materials and directions for participants who have low functional literacy in their native languages;
- screen enlargement capabilities for individuals with sight impairments (many male Hispanics refuse to wear glasses in instructional settings);
- assistive technology which will enhance pronunciation of words;
- alternatives which emphasize visualization and visual discrimination;
- writing tools that facilitate the writing process, such as voiced vocabulary and on-line personalized word lists from which to build compositions.

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To initiate communications with vendors, a letter, along with a press release, was sent asking them to nominate products which they felt would meet the general needs of this project. As a follow-up, meetings were held with industry representatives at the following conferences: the Software Publishers Association Fall Conference; the Council for Exceptional Children TAM Conference; and the Florida Education Technology Conference. Exhibit 1 lists the companies with whom discussions were held prior to spring 1991.

Exhibit 1

**INITIAL COMPANIES WITH WHOM DISCUSSIONS
WERE HELD REGARDING ADAPTATION**

Academic Software
Arandu, Inc.
Augmentative Communication Services
Compact Publishing
Computability
Computer Networking Specialists
Conover Company
Creative Learning
Curriculum Associates/AIS Q Solution
Davidson & Associates
Don Johnson, Inc.
Dunamis
Edmark
Educational Activities
Encyclopedia Britannica Education Corporation
Franklin Learning Resources
IBM Corporation
Intellex Salsa;
Laureate Learning
Optical Data Corporation
Optimum Resource
Peabody College
Prentke-Romich
R. J. Cooper
SkiSoft
Street Electronics
Systems Impact, Inc.
Teacher Support Software
Telesensory, Inc.

The following issues were discussed during these meetings: (a) the feasibility of using specific products; (b) the general terms and conditions for participation; and (c) the need for adaptations, including associated costs.

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It became clear, during the summer of 1991, that the pool of participants from which case study and project participants would be selected in at least two of the sites would be somewhat different from that originally identified in the spring. A number of additional contacts were, therefore, made with vendors of specific products which were felt to be appropriate for these new participants. In addition, some newly-announced products were discussed with vendors. Several meetings with vendors were held during the National Education Computing Conference (NECC) in June 1991. The additional firms' products that could be used to meet participant needs are listed in Exhibit 2.

Exhibit 2

**ADDITIONAL COMPANIES WITH WHOM DISCUSSIONS
WERE HELD REGARDING ADAPTATION**

Applied Voice Marketing (Speak Now)
Covox, Inc.
Digispeech, Inc. (Sound Cards)
Galileo
Hartley Courseware (STAR and Language
Experience Module - beta version)
IBM Corporation (Voice Type, Thinkable)
Lexia Learning Systems
Micro Systems Software (MAGic)
Optical Data Incorporated (Spanish Windows on Science)
Selectronics
Tandy/Radio Shack (built-in CD-ROM drive on 2500)
The Learning Company (Writing and Publishing Center)

After the initial field-testing of products and preliminary attempts to integrate them into the ESL Center core program and after the fall training session, site staff indicated a strong desire to modify the mix of products in their sites based on their perceptions of how specific products would meet the needs of individual students. As a result of all discussions, the following products were ordered for use in the project:

- *Project STAR* and Language Experience Module - beta-test version (Hartley Courseware);
- *Micro-LADS* (Laureate Learning);
- *Talk to Me* (Educational Activities);
- *Optimum Resource Reading Program* (Optimum Resource);

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- *Project Team* and *English Express* - videodisc and CAI versions (Davidson & Associates);
- *Eye Relief* (SkiSoft);
- *Q Solution* (Curriculum Associates);
- *Breakthrough to Language* - Apple version (Creative Learning);
- *TouchWindow* - Apple version (Edmark);
- *Carmen Sandiego Series* (Broderbund);
- *Survival Series* (The Conover Company);
- *Digispeech Voice Card* (Digispeech, Inc.);
- electronic dictionary (Franklin Learning Resources);
- videodisc/bar-code readers (Pioneer Communications of America); and
- several programs from Lexia Learning Systems.

TASK 3: INTEGRATE SYSTEM COMPONENTS

While each of the technologies offered in the project comprised an attractive and logical approach to the ESL instruction, the real utility of each option was the ease with which the instructors could make use of it within their instructional framework. The challenge, therefore, was to integrate the project technologies with the existing curriculum to make a coherent fit among the various products such that the learners could follow a plan of study which accessed available technology at the appropriate point in the curriculum.

The variety of supplementary instructional materials not only spanned the gamut of available educational technologies, but also varied in their audience, content, approach, and quality. Therefore, the process of identifying appropriate lessons within the core curriculum (i.e., CCP ESL) for each instructional option had to be consistent with the features of that option. In other words, the determining factor for the choice of competency reference was either the lesson objective or the optional and/or supportive exercises accompanying a supplemental technology package.

The materials were divided into three categories: (a) those whose curriculum was composed of discrete, discernible, and definable objectives for each lesson; (b) those whose curriculum comprehended an interdependent progression from one lesson to the next lesson; and (c) those which comprised an additional "tool" for instructional delivery. In the first category, *English Express*, the *Q Solution*, the *Breakthrough to Language* series, and Micro-LADS were handily referenced into the operant CCP curricula by matching lessons (or otherwise defined units of instruction) to the CCP lesson objective. The second category included *Project STAR*, Optimum Resource, and Lexia, each of whose individual program characteristics required unique treatment during the referencing process. The tools of the third category were also somewhat disparate in purpose and execution; they included the *Talk to Me* program, *Eye Relief*, *SpeechViewer*, the Franklin Spanish-English computerized dictionary, and TouchWindow. Of these, only the *SpeechViewer* and the Franklin dictionary were included in the lesson references. *Eye Relief* was used extensively where teachers found a need. TouchWindow was used with appropriate software programs.

Because the components of the programs in the first group were discrete and easily identifiable, these were referenced into the CCP curriculum with relative ease. A simple match between CCP lesson objectives and supplemental materials objectives was readily accomplished. The programs in the second group, because of their programmatic nature, presented more of a problem. Often a clear and concise lesson objective was not apparent as many of the lesson presentations spiraled information previously introduced. The progression of these spiraled objectives did not necessarily coincide with those of the CCP curriculum, yielding a referenced lesson which often assumed previous knowledge not yet presented in the core lessons. Generally, these programs were addressed during the referencing process in three manners: (a) the program was referenced as a separate and parallel program (Optimum Resource); (b) exercises accompanying various programmed lessons were referenced to an approximate CCP lesson objective (*Project STAR*); and (c) the program was referenced simultaneously as a parallel program and discrete lesson modules when appropriate (Lexia).

The last of the three categories included programs and materials which were used as independent tools; that is, there was no curriculum to guide use of these devices with the learners. In the case of two of these instructional materials, the IBM *SpeechViewer* and the Franklin Spanish-English dictionary, there were various but limited exercises provided with the devices. These did not comprise a curriculum, lacking as they do structure and an organized presentation of material. In most cases, one-on-one or small group instruction with a tutor was required when using these materials with an instructional objective. Other packages in this category included a *Talk to Me* authoring program, as well as an *Eye Relief* word processing program. Both of these required preparation before use, although both programs were user friendly. Finally, TouchWindow is an application which was useful across age and ethnic groups with the LEP population.

Project sites used the supplemental products in a variety of ways. Hillsboro geared its instruction around Davidson's *English Express* materials, stating that their students "soak this materials like a sponge" and incorporating these materials into the instruction of non-project participants, including evening adult ESL learners. Hillsboro also noted a positive synergistic effect of the combined materials, noting that Davidson, the *Q Solution*, and related computer software have "allowed all non-English speakers to learn the language at an accelerated rate", and have made the instructors' job much easier. The Worcester sites also reported a variety of uses and positive effects for the supplemental products. Burncoat reports that the *Q Solution* was especially effective with their learners, and that the *Q Solution* and Davidson products were also used with non-project students, increasing motivation and independent learning among project and non-project students alike.

TASK 4: FIELD-TEST COMPONENTS

Although this task was not scheduled to begin until May 1991, we recognized, early in the project, the need to identify project sites earlier than anticipated in our original project schedule. This early selection ensured that we would be able to identify the specific types of technology needed by participating students.

SUBTASK 4.1: DEVELOP EVALUATION PLAN

The study evaluation employed a time-series design through which appraisal instruments were administered to project participants prior to intervention and at points during the model intervention, then again after the intervention. This design was chosen to allow for measurement of treatment effect over time. Audio, video, and photo portfolio items were collected to support or negate results of teacher observations and formal test measures.

The standardized cognitive measures of language acquisition were to have included:

- Tests of Adult Basic Education (TABE) to measure standardized grade level equivalent changes in reading comprehension and vocabulary.
- Language Assessment Scales (LAS) to measure levels and changes in speaking skills, as well as listening comprehension and oral communication.
- Basic English Skills Test (BEST) to measure all of the skills covered by the LAS test in addition to writing and reading ability.
- Student Performance Observation Log describing language, listening, communication, reading, and writing ability (see Appendix B).
- Plan and Profile Form showing the number of skills mastered. This form is a record-keeping chart for accumulating scores from unit tests that is available as part of U. S. BASIC's ESL instructional program.

During the course of the study, it was decided to use the TABE only at one site with older youth and adults. The TABE is arguably not well suited for school-aged students, particularly those with language impairments.

The two other standardized instruments, the LAS and the BEST, were considered sufficiently sensitive and quantitative to expose changes resulting from the project. Unfortunately, a full set of these results on a pre/post basis were only collected by one of the project sites.

Simple change score analyses were used to describe the results: frequency counts, percentages, and (where appropriate) some non-parametric statistical tools to determine level of significance.

It became necessary to develop one additional instrument to collect and maintain case study information on individual students under study. This Structured Interview Form assessed short- and long-term effects associated with the learner (e.g., increases in time-on-task), as well as effects associated with the environment (e.g., availability of adequate space). The descriptive case study reports contained herein have been drawn from data collected via this Structured Interview Form.

SUBTASK 4.2: DEVELOP SITE PLANS

Following the initial criteria for selection, a letter was sent to 11 U. S. BASICS' ESL Centers, inviting their participation. In addition to the four programs selected (as described below), we considered ESL Centers in Miami (Florida), New Bedford (Massachusetts), Washington (D. C.), San Diego (California) (2), Waco (Texas), and Bronx (New York). These candidate sites were identified because of existing arrangements for student data reporting, probable availability of an appropriate target population, current use of the ESL Center and CCP programs, and a probable willingness to meet the terms and conditions for participation. Some of the sites were visited by project team members for the purpose of explaining the project and soliciting their active participation. Six of these sites responded with formal indications of interest in participating -- four were finally selected.

The Norton Education Project at South High Community School in Worcester, Massachusetts, is an ESL Center in a CCP lab under the direction of Massachusetts Job Training, Inc. (MJT) The staff includes a mix of employees of MJT and the local school district. MJT is a "partner" of U. S. BASICS and receives its funding from a variety of sources, including the Norton Corporation, under an annual \$100,000 business partnership with the Worcester schools.

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A second Worcester site, also operated by MJT, is the Burncoat Middle School, which uses the ESL Center program. This school serves as a middle-grade bilingual school for the Worcester Public School System. The project is supported strongly by the school's principal and the bilingual education staff.

The third site is the Wilson School in Arlington County, Virginia. The specific program in which exploratory research will occur is the Arlington Education and Employment Program (REEP), funded by the JTPA, state grants, and local hotels. Having full access to all resources of Arlington County schools, REEP offers a bridge for LEP students who have not finished high school and are not yet prepared for college. Because of its proximity, the REEP project also provided a "test site" for some of the technologies to ensure appropriate technical and functional operation.

The fourth selected site is Hillsboro (Texas) High School, which has been a U.S. BASICS partner for several years. The ESL Center is located in the CCP lab and serves primarily middle and high school students. Hillsboro schools are known throughout the State for their exemplary ESL programs.

Two other sites expressed strong interest in participating in the project. The first was New Bedford (Massachusetts) Public Schools, which was in the process of implementing the CCP ESL Center program. In addition to its being located in Massachusetts (which already had two sites), the district, while having a proven track record in implementing CCP generally, did not have the experience with the ESL Center possessed by the selected sites. A second serious contender was the National Puerto Rican Forum in Miami, Florida. The staff of the Puerto Rican Forum were extremely interested in the project and attempted to develop coordinating mechanisms with the Dade County (Florida) Public Schools' Special Education Transition Program. However, these efforts were not successful. Moreover, the Puerto Rican Forum did not have available special education instructional staff. They were willing to write a grant to fund the salary of such an individual but uncertainty existed as to whether such funds would be available.

We believe that the sites included in the project represented geographical dispersion, had the appropriate mix of participants, and were committed to the project, as reflected in the amount of time spent in planning and their willingness to cooperate and report information.

SUBTASK 4.3: CONDUCT SITE STAFF TRAINING

One of the major events of the project was the three-day training/orientation for site staff, which took place in August 1991. The objectives of the session were as follows:

- to train/orient site staff to the various supplemental technologies and software with which they were not familiar;
- to review newly received (but not tested) technologies/software which possibly could be used with individuals at the sites;
- to review with site staff the overall project evaluation components (e.g., summative evaluations and case studies) and provide guidelines for completing forms on site and reporting to the responsible project team leader;
- to review procedures for communications between sites and appropriate project team leaders;
- to orient site staff about ongoing project team efforts to integrate supplemental technologies and software into the ESL core program; and
- to provide opportunities for site staff to meet all members of the project team.

Subtask 4.3.1: Prepare for Training

An extensive amount of time was consumed in preparing for the site staff training sessions. Major activities included:

- testing and installing all products on appropriate equipment for hands-on use during the sessions;
- developing initial correlations between specific ESL Center lessons and supplemental software which could provide branching for participants;
- preparing literature review and training handouts for participants on a range of topics, including identifying learning disabilities and the use of technology in LEP programs with learning disabled individuals; and

- refining and producing evaluation instruments, including observation logs.

During this preparation phase, two major, but anticipated, problems arose: (a) the existence of programming bugs and other technical problems inherent in some of the newer programs, particularly those provided in beta-test or prototype versions; and (b) compatibility problems between the different speech cards used across the software products and the different platforms (Apples, IBMs, and other MS-DOS) and even among models (e.g., XT versus PS/2 Models 25, 30, 55). Obtaining technical support was difficult in many instances because of staff turnover in the publisher/developer firms and/or difficulties in identifying key technical people to provide advice. To a lesser extent, these problems continued during the initial field-test demonstration phase.

Subtask 4.3.2: Conduct Training Session

The training sessions were conducted on August 19-21 following the agenda described in Exhibit 3.

During the three-day training sessions, at least two individuals from each site were involved in the training, along with eight members of the project team. The training was conducted in the conference facility at U. S. BASICS' offices in Alexandria, Virginia, for two primary reasons: (a) the equipment could be more easily set up there than at each site because some platforms had not yet arrived at the sites; and (b) because of travel and other logistical considerations, it was more cost-effective to bring site staff in for training at a central location than sending a large cadre of project staff to each site.

The format involved small working groups which moved from station to station where different products were available for hands-on demonstrations and orientation; for more sophisticated and complex products such as *SpeechViewer*, extensive training sessions (four to six hours) were conducted by outside consultants with follow-up opportunities for hands-on use. For most products, scenarios from initial set-up to actual use of programs were covered.

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Exhibit 3

**AGENDA FOR LEP/SPECIAL
NEEDS PROJECT TRAINING**
August 19-21, 1991

Monday, August 19: 9:00am - 5:00pm

Welcome and Introduction of involved staff @USB/TURNKEY --
Jewell Dassance (10 min.)

Training Overview -- John Sener (10 min.)

Project Overview -- Charles Blaschke (15 min.)
Project Scope, Goals, Outcome, Timetable

Overview of special needs population -- Kay Gore (1 hour)

Background: Existing research literature on target population; special characteristics and needs of learner types by disability; using project materials and technology with these learners.

Using CCP/ESL with special needs populations: barriers and how to overcome them -- John Sener (1 hour)

PM SESSION - Split Session

Group 1: SpeechViewer training -- Arthur Schwartz (4 hours)

Group 2: TouchWindow operation and hands-on -- Jim McIver (30 min.)

Talk to Me operation -- Kay Gore (1 hour)

Lexia Reading Series operation -- (30 min.)

Davidson Speech Master and Language Builder operation and use with CCP/ESL -- REEP staff (30 min.)

Additional hands-on time with project staff assisting (1 hour)

Tuesday, August 20: 8:30am - 5:00pm

AM SESSION - Same schedule as Monday PM: Groups 1 and 2 reverse schedules

PM SESSION - Evaluation Procedures -- Nancy Fones (2 hours)

Requirements for use of assessment devices for project

Rationale for use of each assessment device

Observation techniques

Completion of observation log

Use of Mastery Tests and Plan and Profile Forms

Administrative Procedures -- Charles Blaschke (2 hours)

Expense forms

Shipping addresses

Creation of discretionary accounts

Wednesday, August 21: 9:00am - 3:00pm

AM SESSION

Discussion: implementing an action plan, clarification/identification of unresolved issues and concerns -- Project Staff

Set-up of equipment -- Jim McIver

Hands-on time with equipment/devices

Work on individual IEPs -- Kay Gore

PM SESSION

Continuation of AM activities

IBM MIS training -- John Sener and Jim McIver

The proposed evaluation instruments were reviewed with site staff, who made several substantive comments, after which at least one form was revised to reduce staff burden in completing forms.

TASK 5: CONDUCT FIELD-TEST/DEMONSTRATION

The actual field-test/demonstration phase of the study involving project participants began between the end of September 1991 and the first of November 1991 in the various sites. Differences in official start time may be attributed to different dates of school openings, changes in student assignments, and other factors beyond the control of the sites. Below, we describe the general nature of project staff technical assistance provided to the sites during the preparation phase (June through October 1991) and the operational phase (October 1991 through May 1992). Before describing the specific areas of technical assistance provided to each of the sites, we summarize the general nature of assistance provided.

During the preparation phase, most technical assistance was related to the acquisition and installation of programs on site equipment. In virtually all sites, the availability of specific hardware platforms changed (i.e., some Apple computers were made available for use in the project). Originally, the software and programs were acquired for use on MS-DOS platforms only. In many cases this required reordering software, sound cards, or adaptive devices for use on the other hardware. Another major technical assistance effort was related to matching appropriate sound cards to programs in such a way that available ports and slots could be used without having to change them for different participants. In several cases, this required the inclusion of larger hard disc drives. Another area of assistance related to modifying the U. S. BASICS' management system such that it could easily capture pupil profile information without duplicative reporting. This also required some expanded memory in several sites. Another time-consuming technical assistance effort related to training new staff, as an originally trained staff member in at least one site was reassigned to a position outside the project.

During the preparation phase, the project team -- independently and working with one site (i.e., Arlington's REEP) -- developed correlations which could

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be used for integrating various supplemental technologies into the ESL Center core program. After the training session, other sites developed similar correlations which were then exchanged with other sites.

During the project's operational phase, technical assistance continued through a total of 44 site visits by project team members. The major foci of technical assistance in the site visits and telephone consultation included:

- integration of supplemental technology and software into the ESL Center program;
- sharing solutions and correlations with other project sites;
- clarifying project recordkeeping and reporting requirements to project staff;
- reviewing observation logs submitted for project participants;
- verifying and processing site invoices for expenditures on supplementary materials;
- set-up, up-load, and testing of supplemental technology and software applications;
- additional staff training on computer systems configuration and operation;
- providing trouble-shooting assistance regarding problems with supplemental technology and software; and
- identifying implementation problems and solutions.

Below, we summarize the major technical assistance efforts provided to each of the sites.

a. Arlington County (Virginia) REEP Project

Because of its proximity to the project team, the Arlington REEP Project became the initial field-test site for debugging and solving technical problems associated with virtually all of the programs used in the project. Arlington had a variety of hardware, including CD-ROM drives and videodisc players. The staff also had extensive experience in using various technologies.

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In May 1991, a number of problems were identified regarding specific programs. For example:

- The discs for Creative Learning's program were the wrong size and could not be tested with the TouchWindow; new TouchWindow discs (Apple version) were ordered.
- The available DOS 3.3 was not appropriate for *SpeechViewer*; however, while *SpeechViewer* operated on DOS 4.0, the 5.0 availability announcement was imminent; information had to be collected as to whether or not to wait for the new DOS.
- Numerous points of clarification had to be made with IBM regarding the PS/2 Model 25, whose monitor appeared to be non-compatible with most text enlarger programs.
- The Lexia product designed for use on one version of Digispeech would not work with the upgraded version, which Digicard said it would.

In July 1991, assistance was provided to orient staff on the Davidson videodisc program, IBM's *SpeechViewer*, and *Talk to Me* from Educational Activities. A consultant familiar with *SpeechViewer* from a local school district discussed the program in some detail, although she admitted that most of her *SpeechViewer* expertise was self-taught. It was clear that, for the formal staff training, a very experienced *SpeechViewer* trainer would be required. After two months of extensive telephone conversations with IBM and others, an individual was identified, who did an excellent job during the August training. Attempts were made to set up Educational Activities' *Talk to Me* program; however, a subdirectory was missing and a possible bug was identified. Newer versions of the MS-DOS version had to be requested. Consultation was also provided to staff responsible for developing correlations for the use of *SpeechViewer* with the CCP ESL Center program, as well as Davidson's *English Express* program. Numerous cards and hard discs had to be switched among MS-DOS computers to ensure that the CCP management system could capture the appropriate data while at the same time allowing *SpeechViewer* to be operated on similar hardware.

An additional site visit involved installing the Time Magazine Almanac and Compton's CD-ROM program. During this site visit, the *English Express* (videodisc version) and *SpeechViewer* were also installed on the PS/2 Model 25. To install *SpeechViewer*, a Model 25 slot had to be physically "broken into".

We also reviewed teacher-generated tests to ensure that they could be included as part of the evaluation. We also discussed alternatives to the use of the Echo II card, which was announced but had not been sent to us for use with the MS-DOS hardware.

In October 1991, the REEP staff indicated a need for more assistance in identifying learning disabilities and, specifically, how to use technology to deal with specific problem areas with specific individuals. Project staff and consultants met with REEP staff for a general orientation, which was followed by a four-hour training session, conducted by an LD expert from a local university who had been involved in recommending changes in the ESL Center program to accommodate LD problems.

As REEP staff began to use the *English Express* program, it became very clear that the program could not accommodate the needs of LEP participants who had zero to one functioning levels in their own native language. We agreed to obtain a beta-test copy of the *Language Experience Writer* to complement *STAR*, which was being used for this lower functioning level. The staff indicated that one of the programs initially provided to the site was not appropriate for the population and returned it to U. S. BASICS for distribution to the Worcester site.

One of the major problems that occurred during the initial phase of the demonstration was the emergence of a virus in the *Project STAR* program. As a result of this virus, some of the software and other programs had been destroyed. Project staff consulted with site staff in identifying two anti-virus software programs (Caspar and 2100) to immunize discs from the two viruses. It is highly likely that the beta-test version of one of the programs had contracted a virus along the way. Several vendors had to be contacted to provide new software discs to replace those that had been damaged by the virus.

Another problem arising at that time resulted from the completion on December 31, 1991 of the foundation-sponsored project which funded the establishment of REEP's CCP ESL Center. Around that same time, U. S. BASICS relaxed its reporting requirements for all of member sites, including REEP. As a result

of these events, the REEP Center stated its intention to discontinue reporting data on all program participants, including those in this project. However, we were able to negotiate an arrangement with the REEP staff whereby they would continue to report requested data on participants in this project, even though such data would not continue to be reported on their other program participants.

In March, a series of site visits were made to provide technical assistance and to plan and conduct videotaping for evaluation purposes. The technical assistance focused on what was believed to have been a faulty bar-code scanner. After contacting the manufacturer, the publisher, and several technicians and consultants in the area, the problem was identified as an inadequate fit between the cable and one receptacle. The trouble-shooting time was approximately three days FTE. While it is advantageous to be able to order equipment from manufacturers and publishers directly in order to receive discount pricing, one of the drawbacks of not involving dealers is that dealers will not support any equipment which they have not sold. Hence, we were not able to get adequate support or even loaned equipment during the time the equipment was malfunctioning. Equipment was borrowed from an adjoining school district during some critical instructional time periods.

b. Hillsboro (Texas) High School Project

In late September/early October, a two-day site visit was made by the project's technical specialist in order to perform software applications up-load, testing, and additional staff training. Software was loaded onto 12 computer systems, nine of which were IBM PS/2 Model 25s or IBM-compatibles and the other three Apple systems. During this process, a number of technical difficulties were encountered and resolved by the technical specialist.

Davidson's *SpeechMaster* was loaded on three systems. The site purchased additional peripherals (speakers/microphones) to accommodate the additional applications. *SpeechMaster* required almost two hours to load on a 640k system. For this reason, a minimum of 1mb RAM capacity would facilitate speedier loading and module operations.

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The IBM *SpeechViewer* was loaded and operational on two systems, with an additional application loaded on a third system as a backup. The site purchased additional peripherals (speakers/microphones) to accommodate the additional applications. All systems which had DOS 3.3 (or lower) had to be upgraded to accommodate the application (as explained above in the REEP technical assistance section). It is recommended that the DOS upgrade diskette for systems with DOS 4.0 or lower be included in shipping orders.

Educational Activities' *Talk to Me* application was on two systems. It was found that loading the teacher and student discs was extremely difficult for someone who was not extremely "DOS literate". These findings were reported to the system engineers/analysts at Educational Activities. As a result, improvements were made to the COMMAND.COM file on the teacher disc to make loading easier, reducing loading time by an estimated 90 percent.

The *Carmen Sandiego* applications (USA and World) and *Eye Relief* word processor were loaded on the nine IBM (and compatible) systems.

TouchWindow (Apple version) and ECHO II sound cards were installed on the three Apple IIe systems, so that the site could use the Micro-LADS and Creative Learning software on these systems.

During this visit, the instructors involved with the Hillsboro project were trained in loading and operating all systems and applications. The lead instructor and her assistant were both somewhat DOS literate, although neither was very knowledgeable about hardware. Their main concern was learning how to change sound cards in different systems as different applications were used.

From October 1991 through May 1992, telephone technical assistance was provided to the site, involving the following activities: (1) clarifying qualifications of prospective project participants as they enrolled in the learning center; (2) clarifying project recordkeeping and testing requirements to site staff; (3) assisting with the purchase of additional site supplemental materials; and (4) reviewing observation logs submitted by sites for project participants. Because the site manager at this site had extensive prior

experience with the CCP ESL center core program, the site's technical assistance needs were not as extensive as those of some of the other sites. In February 1992, the principal of Hillsboro High School, who had been a strong supporter of the project since its inception, resigned to take another position; however, this had no disruptive effect on project activities.

Two additional site visits were made to observe case study participants and assist in the integration of *English Express* and other supplemental programs into the CCP ESL core program.

In mid-May 1992, a project technical specialist made a three-day site visit to provide technical assistance and to observe project progress. Technical assistance focused on: (1) assuring that instructors were capable of and comfortable with using the correlation charts which integrated supplementary technologies with the ESL Center core program; (2) checking recordkeeping and reporting procedures to ensure accuracy; (3) identifying any ongoing problem areas; and (d) sharing problems and solutions from other sites. During this visit, the technical specialist also met with the high school's new interim principal to brief him on the project and its significance. In addition, the project site manager had made extensive revisions to the ESL core program in order to use it more effectively with the supplementary technologies; the project's technical specialist reviewed the work for accuracy, quality, and suitability for inclusion in the modification of the program configuration for marketing purposes.

c. Worcester (Massachusetts) Project Sites

Technical assistance was provided to each of the Worcester project sites by various project staff, as described below. In addition, frequent on-site technical assistance was provided to the Worcester sites throughout the project period by the Vice President of Education for Massachusetts Job Training, Inc., a Worcester-based employment and training agency which sponsors U. S. BASICS/CCP learning centers in the Worcester area and throughout Massachusetts. He served as liaison between the project staff and on-site project staff at the two Worcester sites.

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In September, telephone technical assistance was provided to both sites in preparation for the first site visit. Assistance included the following activities: (1) assembling and shipping appropriate software and assistive devices to each site; (2) verifying and processing site invoices for expenditures on supplementary materials; (3) assisting site liaison with preliminary set-up; and (4) installation of software and assistive devices.

In late September, a four-day site visit was made by the project's technical specialist, two days each at the two Worcester sites. Software applications up-load, testing, and additional staff training on system configurations and operation were performed at each site as follows:

- South High School:
 - TouchWindow and Lexia applications were loaded on one system.
 - The Educational Activities' *Talk to Me* application was loaded on two systems.
 - Davidson's *SpeechMaster* was loaded on two systems, one operational and the other as a back-up.
 - IBM's *SpeechViewer* was loaded on two systems, one operational and the other as a back-up.
 - *Carmen Sandiego USA* and *Eye Relief* were loaded on all systems.
- Burncoat Middle School:
 - TouchWindow and Lexia applications were loaded on one system.
 - The ECHO speech card for the IBM was loaded on one system.
 - The *Optimum Resource Reading Program* was loaded on one system.
 - The Educational Activities' *Talk to Me* application was loaded on two systems.
 - Davidson's *SpeechMaster* was loaded on two systems, one operational and the other as a back-up.
 - *Carmen Sandiego USA* and *Eye Relief* were loaded on all systems.

During this site visit, training was also provided in loading and operating all systems and applications to the sites' liaison. Instructors at the two sites were not included in this training for a number of reasons: (1) the

site liaison filled the role of technical support liaison and was readily available to project sites when needed; and (2) the instructors were already occupied with learning how to use the CCP ESL program in addition to performing their regular job duties.

The IBM *SpeechViewer* was also loaded on two systems at Burncoat; however, neither could be made operational during the site visit. Subsequently, various combinations of components were configured in an attempt to isolate the problem component. At first, it appeared that the type of hard drive (QUME) was to blame; however, a defective sound card and incorrect DOS versions were eventually found to be the cause of the problem. The defective sound card was replaced and the correct DOS version installed. Because so many variables are involved, diagnosing such problems often takes a lot time; this problem required approximately eight hours of project staff time and 40 hours of the site director's time to resolve.

From October 1991 through January 1992, telephone technical assistance was provided to both sites, primarily through the site liaison. Assistance provided during this period included the following activities: (1) providing trouble-shooting assistance regarding problems with the IBM *SpeechViewer* (as described above); (2) clarifying recordkeeping and testing requirements to site staff; (3) answering questions regarding use of CCP ESL; and (4) reviewing observation logs submitted by sites for project participants.

Between December 1991 and February 1992, the project curriculum specialist and a key consultant made three visits to the Worcester sites to provide additional technical assistance, as well as perform the groundwork for modifying/packaging components. During these visits, some technical assistance was provided regarding the use of the CCP ESL curriculum. The primary focuses of these visits, however, were on: (1) reviewing project software and print materials in order to develop correlation charts for integrating supplemental technologies into the ESL center core program; and (2) observing case study participants. Use of the software and materials was observed in action. The site staff input, based on their use of the instructional software and materials, was also incorporated into the integra-

tion process. Based on these site visits, correlation charts were developed, compiled, and distributed to the project sites.

From January through May 1992, telephone technical assistance was provided from U. S. BASICS staff, primarily to the site liaison, regarding a variety of minor implementation and procedural issues. The amount of technical assistance required was less during this period, as initial implementation problems had been overcome and the programs were operating more smoothly. Technical assistance during this period focused primarily on assisting sites with the completion and submission of observation logs, procurement of supplementary materials, and occasional technical problems.

In mid-May 1992, a project technical specialist made a three-day site visit to provide technical assistance and to observe project progress. Technical assistance focused on assuring that instructors were capable of and comfortable with using the correlation charts, checking recordkeeping and reporting procedures to ensure accuracy, identifying any ongoing problem areas, and sharing problems and solutions from other sites. In addition, the technical specialist observed classes to assess general use patterns and additional innovative uses of supplementary technologies. The technical specialist also met individually with the site liaison and instructors at both sites to collect additional ideas and suggestions for any modifications or improvements needed to the ESL center core materials or to the supplementary technologies.

TASK 6: DISSEMINATE PROJECT INFORMATION

Throughout the project, a number of dissemination activities promoting the project and reporting preliminary findings were initiated. Many of these were integrated into workshops, presentations, conferences, etc., which were already planned by project team members and hence were not billed to the project. Some of these project promotion activities, used to identify appropriate supplemental products and to make publishers aware of the project, were described above. Below, we highlight the project's major dissemination activities:

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- presentations about the project conducted by staff a consultant at a number of practitioner workshops sponsored by Jostens Learning Corporation, Hartley Courseware, and Davidson & Associates;
- handouts and descriptive information about the project distributed at the fall and spring Software Publishers Association Conferences and to attending members of the Education Section meetings at the Florida Education Technology Conference;
- preparation and dissemination of a press release summarizing products and findings distributed to special interest groups and special sessions on multiculturalism during the April 1992 CEC Conference (vendors whose products were involved in the project were also provided copies for distribution at their booths);
- distribution of descriptive material and program participation at the TAM Conference in January 1992;
- preparation and dissemination of an updated press release sent to T. H. E. Journal, which formed the basis for the lead article in the June 1992 issue (see Appendix C) more than 350 requests for the final report have already been received;
- limited distribution of preliminary findings and sample case studies to special interest groups and key members of the research and development community expressing an interest in the project during the July 1992 OSEP Project Directors Meeting;
- presentations/discussions regarding the project and project activities at the TESOL, Adult Literacy and Technology, and AAACE annual conferences by project staff and consultants;
- on-site demonstrations during the April annual conference of U. S. BASICS partners at the Arlington REEP Center, attended by more than 50 U. S. BASICS partners from across the country;
- editing and production of videotape footage (approximately three hours), which will be sent to the publishers/vendors of products which were widely used in the project (these tapes include teacher comments and suggestions for improvement in use with the target population);
- a transmittal letter and copies of the case study reports which will be sent to the participating vendors and other groups;
- dissemination of the Executive Summary and/or Final Report to individuals who have requested the report throughout the project and, as a result of the June 1992 T. H. E. Journal announcement regarding its availability;
- transmittal letters and copies of the Final Report to individuals at participating sites; and
- submission of all reports to USED/OSEP.

III. PROGRAM OPERATIONS

In this section of the report we provide summary descriptions of program operations at each of the four sites. Based upon on-site instruments and classroom observations, these descriptions include outlines of the hardware configurations, classroom staffing, software usage, and instructional patterns.

A. HILLSBORO, TEXAS

The Hillsboro site was housed in the local high school, situated in the middle of a small town just two blocks off the main street. The program in which the OSEP project operates was an alternative school within the regular high school. The alternative school provided a variety of services and certifications for students ages 12 through 19. The CCP ESL program has been in use for three years.

Hillsboro had not previously experienced the large LEP and non-English-speaking student population that characterizes much of Texas. However, within the last year or so, many Hispanic families had moved into the district and ESOL/bilingual instruction was becoming more of an issue. For the group of LEP students who attended the alternative school for part of the day, there was a Spanish-speaking aide to assist in bilingual instruction.

1. CLASSROOM CONFIGURATION

The Hillsboro site purchased their CCP ESL Learning Center in early 1990 as an add-on to their existing CCP Center. The Hillsboro configuration was similar to that of REEP (see below), except that the Hillsboro site had only 15 audiocassette players. Hillsboro also used the upgraded MS-DOS version of the CCP management system. Hillsboro was unique among the project sites in that the CCP and CCP ESL labs were in the same room during the course of the project; as a result, the Hillsboro site had access to more computers (11) than the other project sites.

The program occupied the space formally used by agricultural sciences; the area was gutted and redesigned to house this program. The large space was divided by a wall which separated approximately one-fourth of the space, which was used by the mathematics teacher. The wall, however, stretched only about two-thirds of the way across the room, thereby leaving the two spaces open.

Around the perimeter of the rooms were 14 computers -- four Apple IIs and ten IBM PS/2 Model 25s -- as well as printers. In the center of the two rooms were several long tables with approximately eight chairs per table for students. Each room was also filled with print materials and the walls were covered with bright posters and other colorful materials.

2. STAFFING

The teacher working with the project exhibited an obvious rapport with the students and mutual respect between the teacher and students was evident. The groups assigned to the alternative school classrooms were usually small -- not more than 15 students at one time; however, the center was a magnet for students from the entire school who came to use the computers principally to write reports, but who also got support and personal attention from the alternative school instructors. There was a positive feeling about the room; students across the school seemed drawn to it.

It is worth noting that the alternative school and its instructors had strong support from the school administration, as well as the school board. The Principal made it a point to come by the alternative school area to introduce himself to project observers and to express his (and the school's) support for the project. In addition, by coincidence, a project observer happened into a local bank in search of an ATM and met the chairman of the school board, who is also the chairman of the bank. The chairman, when he realized that the observer was visiting the school as part of the OSEP project, voiced strong support for both the alternative school program and the project.

The instructor of the program noted that the Hillsboro program has been highly successful with at-risk students and those experiencing learning problems. Parents had moved into the district so that their children, who were having

trouble elsewhere, could take advantage of the program. The ESOL component of the program was a recent addition.

3. SOFTWARE UTILIZATION

The instructor and students had interwoven most of the programs provided by the OSEP project into their daily instructional routine in the fall of 1991. The CCP program had gaps that would have been very troublesome if it were not for the availability of the project programs. Some specific problems that the instructor noted were that the academic tier did not always challenge and stretch the students, while the functional tier was often too difficult.

During a typical day of observation, the non-English-speaking group and the classroom's instructional aide were working with the Davidson *English Express* program. The students came into class promptly and seemed eager to get started. Since the lab area is constantly being used by individuals from across the school, the students did not take particular note of the observer. The aide had students sit around a table in a semicircle so that each could clearly see the video monitor to which the laserdisc player was attached. The aide used the bar-code reader to scan pictures and then had students identify, in English, the object. The aide then elicited conversation in English among the students, drawing from each student's personal experience. Students were motivated and enthusiastic. Despite their being late middle school in grade and age, the students did not appear self-conscious or inhibited when attempting to express themselves in English.

In a later conversation, the aide noted that *English Express*, the *Q Solution*, and the Franklin hand-held talking dictionaries were the most effective programs she was using with her younger LEP students. The aide explained that the area with the most promising gains was in the use of English to socialize. She felt that the students were mastering English at a much more rapid pace because of the addition of these programs.

Both the aide and the instructor cited, as significant to enhancing learning, the self-paced nature of many of the supplemental programs provided by the project, as well as the capability of providing individual practice in oral

and aural skills. The Davidson and Educational Activities programs (the latter just being implemented at the time), which enable students to correct pronunciation problems, were found to be very effective. Another important outcome was the accelerated acquisition of vocabulary that the students were exhibiting.

Although the instructor and the aide gave most of the credit for the success of the supplemental programs to the programs themselves, the observer noted that the programs were being adapted to meet the unique needs of the Hillsboro group. For example, throughout the supplemental programs, the instructor and aide stressed writing, even in situations for which the publishers never considered using writing. The emphasis on the additional modality may be one of the variables influencing the accelerated learning.

During one day of observation, one student who, at the beginning of the year had exhibited slurred speech, was intently working on the IBM *SpeechViewer*. The instructor observed a marked improvement in the student's speech and attributed this to the supplemental software. The student operated the program with no intervention or assistance from the instructor. On the second day of observation, the student was working with the *Micro-LADS* program in preparation for the next day's work on sentence mechanics. As with the day before, the student entered the room, received the daily assignment, and immediately began working intently without need of adult supervision until the end of class. The instructor emphasized that this self-motivation was not evident before the advent of the OSEP supplemental programs.

On the first day of observation, another student was working with the *English Express* program. She appeared more hesitant than other students to provide answers and to interact in English. The aide and instructor both noted that this student seemed to have difficulty working with print; however, she did not exhibit slow response time or careless responses when she is working on the computer. The instructor attributed this improved behavior to greater understanding that the student received from the computer programs. On the second day of observation, this student was working on the computer with the Creative Learning program to enhance sentence structure skills. While the

student did request the instructor's assistance three times, she did not appear frustrated or unable to handle the work successfully.

During the first observation, a third student was working with a peer on the *Q Solution*. Both entered the room promptly, received their assignment, and immediately began working. The student scanned a word for the *Q Solution* to voice, talked to the peer in English about the word, and wrote the word in a notebook. During the second observation, the student was working on a teacher-generated lesson in the *Talk to Me* program -- listening to the word and attempting to speak the word with the same pronunciation as the teacher. The student went over the same words until she felt confident with her pronunciation. The student appeared very motivated by the fact that the teacher's voice was the model for the pronunciation.

A fourth student was working with the *Micro-LADS* program on prepositions during the first day of observation. This student was the least self-directed and had to be closely monitored by the instructor. Although she was engaged in the lesson while working on it, she did not go to the next lesson at the end of the first until the teacher directed her to do so. She did, however, seem to be mastering the concept from the program and took a great deal of pride in her success. On the second day of observation, the student worked in a small group on the laserdisc part of the *English Express* program. She interacted with the group with no seeming self-consciousness and experienced a great deal of success in the answers and comments she provided.

The *Eye Relief* program was not up and running at the time of the initial observation. The observer did get it working on the IBM machines and gave the instructor and aide a brief introduction to the capabilities of the program. Both appeared very eager to implement the program.

B. WORCESTER, MASSACHUSETTS (Burncoat Middle School)

Burncoat Middle School was a sprawling, older, multi-story brick structure surrounded by multi-storied, single-family dwellings in a lower middle-class neighborhood of Worcester.

1. CLASSROOM CONFIGURATION

Burncoat Middle School received its CCP ESL Learning Center system in 1989 as part of its participation in a literacy initiative sponsored by the Ford Foundation. This CCP ESL configuration was similar to the one at REEP. Burncoat upgraded its CCP ESL Center in 1991 by purchasing (with South Community High School) a set of Functional ESL Audioactive Courseware with project funds.

The computer lab where the CCP system and supplemental technology programs of this project were located was situated in a second-floor classroom which had been converted to accommodate the computers and other materials. The room was organized so that it appeared to be a traditional classroom with a teacher's desk, sitting in front of a chalkboard, facing neat rows of student desks. A long table partitioned the more traditional front section with the desks from the back of the room, where four computers sat on long office tables. On the table separating the room were the tape recorders, which were an important part of the CCP program.

On one office table at the back of the room sat an Apple IIe computer, which was used as the management computer for the CCP program. Attached to the Apple was a scanner for scanning-in paper-administered CCP tests. The Apple II was also the station of the *Micro-LADS* program. To the right of the Apple II was an IBM PS/2 Model 25 to which was attached a Qume cartridge drive. This IBM has been designated the IBM *SpeechViewer* station. Sitting to the right of this IBM was another IBM PS/2 Model 25 which ran the *Optimum Resource Reading Program*. Perpendicular to the right-hand side of the table, nearest the second Model 25, was another office table on which sat a Tandy 1000 configured to run the CCP software, as well as the software portion of Davidson's *English Express* package. Finally, to the right of the Tandy was an IBM clone (an Emerson 386SX with VGA monitor). This was the station for Educational Activities' *Talk to Me* program.

2. STAFFING

The teacher in this class was intent on keeping control; students with the type of learning problems her student had needed a great deal of structure. The teacher was very structured in her approach and worked very hard at maintaining quiet and order in the class.

The teacher was candid in her explanation of the slow pace of program implementation. Personal and family illness forced her to be absent frequently. Furthermore, having no previous experience with the CCP program has meant that she had to learn both the CCP program and the supplemental programs. Unlike the teacher at South Community High School, this teacher had her class for most of the day. Time in the computer lab disrupted the careful structure and the control over the school day that the teacher felt the students need.

The teacher used the computers, however, to motivate positive behavior. She made her reasons for selecting the students who worked on the computers (and thus be observed closely for the project) very clear to the class. The reward for good behavior was time on the computer!

In both the high school and the middle school, the presence of the lab instructor/aide helped implementation by sharing the burden with the teacher. Furthermore, the technical assistance from the site coordinator was invaluable. He not only kept the computers running and got the programs to work on the computers, he also familiarized himself with the programs so that he could provide assistance for the teachers.

3. SOFTWARE UTILIZATION

On one day of observation, 11 students were present for the class. Of these, five were those selected for observation on the project. The teacher selected the students based on their behavior, selecting cooperative and task-oriented students.

When the students arrived for class, they appeared to be regular middle school students. Noise and confusion reigned; most of the students milled about the room. It took the teacher and the computer room aide several minutes to quiet the group and get them to task. With the exception of two students, the class seemed to need explicit directions and students were unable to direct their own activities. Most of the students were assigned to stations where they worked with the tape-recorded parts of the CCP program or with the printed materials. The computers were reserved for students participating in the project.

One of the more self-directed students worked on the IBM-compatible with the Davidson *English Express* software. At the beginning of the class, she did not wait for directions from the teacher or aide. She went directly to the computer and began working. At first observation, no handicapping condition was evident; however, after close observation, it became evident that she was a very slow learner. However, she responded well to the reinforcement and the self-paced nature of the Davidson program. Throughout the class period, she was engaged in learning.

A second self-directed student went directly to the Tandy and began running the CCP software. A couple of times he requested help from the teacher, but for most of the class he was absorbed in the computer software.

A third student needed little direction from the teacher to get started on the *Optimum Resource Reading Program*. Unlike the more self-directed students, however, she did not go directly to the computer, but waited to be assigned. However, once on the computer, she was not distracted by other students, nor did she need or request assistance from the teacher or aide. The teacher remarked that she found this program particularly helpful for her students.

Yet another student waited to get to work while some confusion about how he had scored on a recent test was cleared up. He was then assigned to the Apple II computer to work on the *Micro-LADS* program. Since the Apple is also the instructional management station, using it with students prevents its being used to score the fill-in-the-blank CCP tests. Like his peers, this student (who was selected for close observation in the project) was quiet and

attentive while working with the computer. He did request help from the aide on several occasions.

Because of the limited number of computers working in the room, a fifth student worked at a tape recorder with the CCP program. While he stayed on task, he appeared to be less engaged than his peers who were on the computers. He seemed more easily distracted by what was occurring around him in the classroom.

While none of the students selected for observation in the project exhibited severe handicapping conditions, each of the students was either a slow learner or had a learning disability.

C. WORCESTER, MASSACHUSETTS (South Community High School)

South Community High School was an older, two-story brick structure placed in the heart of a middle-class neighborhood of Worcester.

1. CLASSROOM CONFIGURATION

South Community High School (SCHS) used the standard CCP ESL Learning Center configuration installed in 1989 for their participation in the UPS Foundation-sponsored literacy initiative. The CCP ESL configuration was similar to REEP's, with two exceptions: SCHS used the Apple-based management work station, and the CCP ESL computer learning stations had external QUME drives rather than identical hard drives. The SCHS site also added a number of other computer to their learning lab, including Tandy and other MS-DOS compatibles.

The computer lab where the CCP system and supplemental technology programs of this project were located in a small room which could be accessed through three doors. The door from one hallway provided a popular short-cut to another set of classrooms through the room. This could be disruptive when students were working. The lab was a bright, uncluttered space with a wide expanse of windows dominating one wall. Several standard student-type desks occupied approximately half of the room, with a larger desk for the lab

coordinator facing the student desks. At the back of the lab coordinator's desk, against the walls, were the computers.

Six stand-alone computers were located on long, office tables. An IBM PS/2 Model 25 faced the wall to the right of the back of the instructor's desk. This machine was set-up to run the IBM *SpeechViewer* program. Next to this computer and sharing the same table was a Tandy 1000, which ran the CCP software but which was also configured as a backup computer for the software portion of Davidson's *English Express* package. Perpendicular to this pair of computers was another table, situated against the wall to the back of the instructor's desk and to the right of the door that made the room a convenient short-cut. Two Tandy 1000s sat on this table with an Apple IIe. The Tandy closest to the door was configured as the primary machine for the Davidson software. The Tandy 1000 to its right was used for Hartley's *STAR* program (Levels 1-3) and Educational Activities' *Talk to Me* software. The Apple II computer had the Edmark *TouchWindow* and a printer. This was the station for *Breakthrough to Learning*, *Micro-LADS*, and the *STAR Language Experience* module. Perpendicular to the table and situated on the wall with the bank of windows was a third table with an IBM clone (an Emerson 386SX with VGA monitor). This was the station for the Lexia software. In addition, *Eye Relief* had been placed on the hard drives on several of the MS-DOS computers.

2. STAFFING

The teacher, during and after class, noted that progress in implementing the project had been hindered by her unfamiliarity with the CCP program when she first became involved with the project. Thus, she, like her peer at the middle school, had to master both the CCP program and an array of supplemental programs and then try to weave everything together into a coherent package. An additional impediment to smooth implementation has been lack of an unencumbered period during the school day when the teacher could spend time in the CCP computer lab familiarizing herself with the programs. The teacher took a computer home over the two-week Christmas vacation to become more familiar with the programs. In addition, the U. S. BASICS support person spent a week working with the sites in Worcester, in early January, to reference the supplemental materials to the CCP program.

Despite the initial problems, the teacher was very positive about the program. Rather than being annoyed by the glitches which accompany any new project, the teacher seemed to view these problems as a challenge and readily acknowledged that the end benefit to her students would be well worth the initial discomfort. The reaction of the teacher may be a result of her flexible nature. She appeared to handle ambiguity well and did not need to feel in control of a situation in order to function well. Her sense of humor and innate intelligence seemed to serve her well in this situation also. In addition, she obviously felt very comfortable with and enjoyed her students. She seemed to be an excellent special education teacher as well as ESL instructor. Thus, implementing a new program, no matter how confusing, did not impede her success as a teacher. She had a good student:computer ratio to work with, a small class (ten to 12 students at most), and two aides. While some of her students had serious physical, emotional, and intellectual handicaps, the environment was very supportive of success.

The teacher generally moved among the students, giving encouragement and praise. She exhibited good rapport as well as control and had an intuitive sense of who needed her attention. The students obviously respect her as they listen to her and respond quickly and positively to admonishments, directions, and praise.

3. SOFTWARE UTILIZATION

During the day of observation, 11 students were present for the class. Of these, four were those selected for observation in the project. The classroom atmosphere was one of intense concentration. It was evident, however, that the students were mentally and physically challenged.

One female student was working with the help of an aide on the IBM *SpeechViewer*. The student's handicaps were such that the program challenged her as well as engaged her attention. To the right of this student, another female student, also assisted by an aide, was working on the CCP ESL software. This student exhibited severe physical handicaps which require a full-time aide. At the back table, a male student was working with the Hartley *STAR*

program on one of the Tandy 1000s. To his right, two male students were working cooperatively with the Davidson *SpeechMaster* software. A female student was on the Apple IIe computer system with *Micro-LADS*. Finally, a male student was working with Lexia software on the MS-DOS.

During observations, the student working with the Lexia software interrupted the teacher several times, ostensibly for directions and clarification, but more for the teacher's attention. It was evident that he needed close supervision and a carefully structured learning environment with few distractions.

The adult working with the student on the *SpeechViewer* encouraged her progress and praised her responses. The student appeared to be highly motivated and on task. One of the students using *SpeechMaster* had an engaging, open personality. While he was very interested in the class observer, he was equally eager to display what he was doing. He took great pride in his progress and in showing what he could do on the computer. The teacher noted that his companion at the computer was functioning way beyond the other students in the class. The project student seemed to enjoy the presence of the other student because it enabled him to have a greater success on the software than he might otherwise have had working alone. This student appeared to progress better in cooperative learning situations, even with less able peers, than when he was working alone.

D. ARLINGTON, VIRGINIA (ARlington Education and Employment Program)

Different in many respects from other sites, the REEP Learning Center was located in what was once the Wilson Elementary School on a heavily traveled street. The REEP Center handled a large population of LEP learners from a wide range of language backgrounds and with many learning disabilities.

1. CLASSROOM CONFIGURATION

The ARlington Education and Employment Program (REEP) originally used the "standard" CCP ESL Learning Center configuration installed in 1989 as part of their participation in the UPS Foundation-sponsored literacy initiative. The configuration included 17 audiocassette players, five language card readers,

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two CCP ESL computer work stations, and one Learning Center work station. REEP used the upgraded MS-DOS version of the CCP management system. In addition, they had also been provided in 1990 a RAM upgrade to 2MB for their CCP management system program to accommodate the unusually large number of learners (1,000 plus) in their programs.

REEP had thoroughly integrated their CCP ESL instructional programs into a larger language learning lab, which contained numerous other computers, including MS-DOS-compatibles and Macintoshes, as well as numerous other CAI programs such as *Bank Street Writer*.

The REEP Center had approximately 20 MS-DOS, Apple II, or Macintosh work stations. Available to participants in the Center were more than 250 software programs, excluding the supplemental software and assistive technology purchased through the project. In addition to computer work stations, within the Center and other classrooms in the school were VCRs and monitors, videodisc players, CD-ROM drives, and other hardware and peripheral equipment. Over time, much of the supplemental technology actually replaced some of the ESL Center components, even though the supplemental software and technology were correlated to the lessons and levels within the ESL Center program.

2. STAFFING

The REEP Center director and staff were more experienced in using a wide variety of technology-based software and supplemental materials than were those in the other sites. REEP's permanent staff was supported by interns -- Ph.D. candidates from two local universities -- who were not only knowledgeable about methodological approaches, but were also experienced in dealing with linguistically diverse populations. While none of the staff had extensive training in special education, most had experience in dealing with LEP individuals who had symptoms associated with learning and other disabilities. Nationally recognized consultants in such areas as learning disabilities were available for diagnosis and instructional planning, as appropriate. For these and other reasons, the REEP site staff took the lead role, among the four sites, in developing correlations between the various supplemental technologies and the ESL Center core program; these correlations

were provided to the other three sites and were found to be extremely helpful. The REEP staff also developed starter lessons, visual displays, and other supplemental print materials, often on a trial-and-error basis, to work with individuals functioning at extremely low levels who could not follow directions included in specific software programs.

3. SOFTWARE UTILIZATION

The project participants were selected by Center staff based on the severity of their dysfunction (either their handicapping condition or their academic functioning level in their native language). The learning problems of these individuals varied significantly. One Asian participant had been in the program for more than two years without demonstrating significant increases in language development or literacy skills. Another older Hispanic participant had suffered a stroke, which resulted in related learning disabilities. Several Hispanic males had sight impairments but refused to wear glasses during the instructional period, especially when females were in the class. The project participants developed a degree of camaraderie during the project for a number of reasons, including: (a) many higher-achieving non-participants were able to exit from the program on passing the GED; (b) project participants received more individual teacher time, especially in getting started in particular lessons, then did other participants; and (c) several participants worked as peer tutors with other participants at individual work stations.

The learning environment within the REEP Center and Wilson School was well planned, but only informally structured. Although participants were scheduled for instruction at particular convenient times, they were able to come and go as they wished. The hallways and Learning Center walls were covered with stories, letters, etc. written by participants. Teachers worked closely with project participants on a one-to-one or one-to-two basis. Flexibility was provided for cross-age tutoring at the work stations. While most of the instructional staff who worked with participants were trained to use all of the software and most of the assistive technology, over time one or two staff took the lead role with a particular assistive technology or program (e.g., *SpeechViewer*, *English Express*). Although individual teachers worked with

participants at work stations, a great deal of time was spent before and after Center operations in joint planning among groups of four to five teachers who worked with individual participants over the project's duration. Beyond the evaluation requirements of the project, teachers routinely collected mastery and anecdotal information on participants as they monitored progress very carefully and relied heavily on such documentation in group planning meetings.

IV. EVALUATION RESULTS

The use of assistive technology and software across the four sites appears to have generated substantial gains in student learning and other positive outcomes. In this chapter we summarize aggregated results of the project sites and highlight some conditions under which the technology was particularly successful.

A. OVERALL RESULTS

The combined effects of using computer-based instructional tools were evident in the area of instructional improvements, as well as in learning gains. With respect to institutional or organizational improvements, the following outcomes resulted as direct benefits of the project:

- improved productivity of teachers and students;
- stronger agency commitment to use of technology;
- increased teacher collaboration; and
- improved learning materials and reinforcement options for a broad range of learners.

In addition to hearing, speech, visual, physical, and information processing impairments and behavioral maladjustments, the specific kinds of learning problems faced by project participants included:

- omitting or transposing letters;
- inability to retain information;
- difficulty isolating words heard;
- illiteracy in native language;
- difficulty working independently;
- inability to concentrate and stay on task;
- difficulty forming letters;
- difficulty connecting sounds to letters;
- high frustration levels;
- social withdrawal and absenteeism;
- lack of auditory discrimination skills; and
- disruptive behavior.

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A combined use of microprocessor-based products over an 18-month period led to improvements in their:

- articulation;
- comprehension;
- motivation;
- productivity;
- self-expression;
- confidence;
- willingness to help others;
- ability to work independently;
- self-monitoring capabilities; and
- sociability.

Learners actually went from "talking to the computer" to using language in all forms of speaking, reading, and writing. These results seem attributable to the:

- computer's ability to reward success -- success builds self-esteem and raises the anticipated learning threshold;
- interaction rewarded by multimedia tools;
- enthusiasm that mounts with success;
- related increased speed of learning; and
- relative ease with which the computerized devices and software were assimilated into the normal routine of classroom activities.

Collectively, the assistive devices contributed individually to overall learning gains by symbiotically making participants more comfortable with speaking, reading, and writing. Each product was found to make substantive contributions to every language skill -- from pronunciation, to reading, grammar, listening, speaking, and writing. Moreover, each program went beyond the mere academics of language learning. Important life skills such as reading maps were emphasized in each program in a sophisticated way so as not to offend the adult learner.

The contributions each product made in its own right, or most salient outcomes per product, were:

- *SpeechViewer's* ability to help students hear and correct own speech problems by providing assistance with vowel replication and symbol identification;

- *SpeechMaster's* assistance with sound/symbol correspondence and with replicating the form of letters (i.e., writing what is seen);
- *Micro-LADS'* assistance with mastery of simple grammar, assistance in recognizing phrases and English words, and ability to target specific grammar problems to be worked on;
- *Project STAR* program's assistance with repeating letters and sounds;
- *Eye Relief's* assistance with word recognition through enlargement and screen color (using vocabulary from *SpeechMaster*);
- *Optimum Resource's Reading Program's* assistance in phonetics and pronunciation;
- *English Express's* assistance in increasing motivation and grammar skills, as well as promoting group activities and collaborative peer tutoring;
- *TouchWindow's* assistance in vocabulary development and in understanding sentence structure and phrasing;
- *Talk to Me* program's assistance in isolating and learning particular consonant sounds;
- *Q Solution's* assistance in letting students use words to create their own sentences and stories; and
- The *Comprehensive Competencies Program's* print and audio materials assistance in improving reading ability.

B. SUCCESSFUL INSTRUCTIONAL GROUPINGS

The number and diversity of products made available to project participants gave teachers increased flexibility to address individual needs through a variety of language learning approaches. The computer software helped build self-esteem that carried over into other classes. Confidence in their ability to learn spurred more learning among all participating learners.

The products reinforced each other because they were found amenable to group, as well as individual, work. Lessons from the *Comprehensive Competencies Program* were completed individually, or by teams of two or three learners with one student serving as coach and technician (to run an audiotope while the other student(s) repeated the recordings on it, for example). The Lexia and *STAR* programs were used for paired practice from time to time, as well. The Keystrokes to Literacy Approach was frequently used with the *Eye Relief* word

processing program as a conversation starter to help students be more comfortable, not only with their independent ability to use the keyboard, but with conversing with fellow students.

C. SUCCESSFUL PRODUCT COMBINATIONS

In some cases, parts of one instructional product were used in a specific order as a preferred course of action. For example, it proved effective to use *English Express* for vowel accuracy, then to use the *SpeechMaster* component for help in hearing and spelling new vocabulary, and then to use the *Language Builder* component to practice writing what was heard and spelled. On other occasions, *SpeechMaster* was used after *SpeechViewer* to help students associate sounds with symbols. Appendix D contains a student-by-student breakout of which products were used with whom, with what kinds of results, to address given learning deficiencies.

English Express components were successfully combined with several other products from other publishers, as well. Pronunciation was promoted by combining *SpeechViewer* with *Talk to Me* and *Q Solution*. *SpeechViewer* was used widely, and in virtually every case was moderately to very effective with students across all sites throughout the project.

English Express computer components were also used in conjunction with the CCP functional/academic print materials to help build vocabulary, comprehension, and retention skills. Using Davidson's *English Express* program along with *Q Solution* allowed all non-English speakers to learn language at an accelerated pace. When the print materials from *English Express* were too difficult, the *Q Solution* books turned out not to be; so the two programs were piggybacked in practice.

In other cases, several products were used in tandem to expedite learning. The Franklin dictionary was frequently used across sites to reinforce all language skills under study. Students would use the Franklin dictionary in connection with vocabulary work in the *STAR* program (e.g., unrecognized words that appeared in a software program could be looked up in the Franklin dictionary).

When reviewing grammar and writing skills, for example, the *Micro-LADS* and IBM computer programs on punctuation and combining sentences were often used first (sometimes along with the *Optimum Resource Reading Program*), before moving into the CCP print materials, as a natural advance organizer to propel language learning beyond the mere acquisition of basic skills.

Teachers would combine the use of *TouchWindow* and *Micro-LADS* to increase reading recognition skills (on the one hand, *TouchWindow* enables easy computer entry of responses, and on the other hand *Micro-LADS* provides excellent practice in grammar). Often, after using *TouchWindow* and *Micro-LADS*, *Talk to Me* would be added to the instructional equation to reinforce reading skills through listening -- hearing now English is supposed to be used. These three products were often used in tandem to help students listen to understand -- a necessary job skill.

Reading and listening skills were jointly worked on by relying on a combination of four products: *English Express*, *Talk to Me*, *TouchWindow*, and *Q Solution*. The products were not favored over each other or used in isolation. All four allowed students to hear correct pronunciation and phrasing. *English Express* and *Talk to Me* allow speech, require a response, and provide correct feedback. *English Express* and *Q Solution* develop work vocabulary needed outside the classroom.

Products used simultaneously to promote grammar skills included *Micro-LADS*, *TouchWindow*, and *Talk to Me*. *English Express* was added to the mix when listening and speaking skills also needed to be reinforced. IBM- and Apple-executed software provided basic programs that assisted with grammar as well. When more oral reinforcement seemed needed, additional work with *Q Solution* or *SpeechViewer* with *English Express* often helped. Appendix E lists the skills each product influenced the most throughout the duration of the project.

D. SAMPLE INSTRUCTIONAL SEQUENCE

Many students realized immediate success experiencing the computer activities only to be disheartened in turning to related paper-and-pencil or print work that seemed, at least on its face, more difficult. In response, project teachers devised a step-wise approach to work students up to the print part of learning.

Some products, like Davidson's *English Express*, were found to be most efficient as starters or icebreakers because of their motivational characteristics, ease of use, and/or interest or ability level match to the respective students. So, teachers would often start an instructional period with a laserdisc sequence from *English Express* as a large group activity to introduce the entire class to the theme or concept being studied. The "Zap It" feature of this program was noted as being particularly effective in helping students develop retention abilities.

Second in the instructional sequence would be the use of materials from the *Q Solution* -- cited repeatedly for generating self-confidence through providing immediate reinforcement in forming sentences, creating paragraphs, and understanding language concepts. One student would repeat a scanned word to a partner who collaborated and critiqued the other's production. Edmark's *TouchWindow* would be added to the mix when kinesthetic reinforcement seemed appropriate. *Micro-LADS* would be used as follow-up in cases where additional grammar development was needed.

Third, computer-assisted instructional programs (such as those from Davidson's *English Express*) or some of the drill-and-practice programs would follow, for example, in the area of spelling, to cement learning, reinforce concepts, serve as individual practice, and at times even be a reward for a job well done.

Fourth, the student would read and/or write from the printed materials provided through the project. For example, a student might read a short passage from some of the CCP/ESL print materials and use the Franklin dictionary to help define some unknown terms. Or, the student might fine-tune

skills on a highly personal basis by, for example, remediating speech slurs with *SpeechViewer* or *Talk to Me*, working on slowing down speech, or improving enunciation -- perhaps writing down what he or she had just dictated.

E. SIMULTANEOUS TEACHER DEVELOPMENT

The project spurred creative supplemental lesson development among participating project staff at one location in particular. They felt the CCP/ESL program to be either too basic or too accelerated, depending on the specific weaknesses of given learners at different points in time.

The CCP/ESL program, as originally designed, moves learners along a continuum of listening, speaking, dialogue, grammar, reading, and pronunciation skills that spiral through increasingly complex concepts and subject matter.

When the teachers found the materials to progress in a different direction or pace than the students, they could have chosen to shelve the materials. Instead, they took the time to combine some sections and rewrite others. Their revised scope and sequence of skills for the CCP curriculum is included in Appendix F for professionals who replicate project procedures in the future. It is more application-oriented than the original CCP and focuses on mastering letter and sound recognition and number usage, applying these skills to situations involving family, time, money, banking, food, housing, plants, animals, transportation, maps/routes/signs, shopping, parts of the body, medicine and medical help, appointments, community living, completing forms, and finding and keeping a job.

F. SHORT-TERM RESULTS

Analysis of data from the Observation Interview Logs showed teachers from all four sites believed the project generated learning. All of the participating teachers considered motivation a key project outcome. Three of the four felt the project often boosted learning, increased time on task, independence, and cooperative learning; the fourth teacher believed the project sometimes or seldom delivered on these goals. These results are charted in Exhibit 4.

G. LONG-TERM RESULTS

All teachers agreed the project often provided learning alternatives. Three-fourths also believed that it often increased access to learning, improved student self-esteem and language acquisition, and boosted staff satisfaction, teacher collaboration, and agency commitment; about one-fourth of the teachers were not as positive as the others.

The findings were somewhat mixed on how often the project contributed to socialization on the part of the learner. About 25 percent of the teachers said "sometimes", half said "often", and 25 percent said "seldom".

H. IMPLEMENTATION EFFECTS

All project teachers thought support elements were often adequate in terms of equipment and administrative support. All four also gave highest marks to the adequacy of training and administrative priority given to the project. The effectiveness of the various supplemental materials, including the CCP/ESL program, received the full continuum of evaluation ratings on the Observation Interview Log.

I. LEARNING GAINS ACCORDING TO MASTERY TESTS

In addition to teacher opinion of learning gains, actual achievement was measured throughout the project via pen-and-pencil -- objective-based mastery tests that assessed specific skills covered by project materials. One site administered both the LAS and BEST tests; the other three sites administered only the BEST. The scores from both tests have been equaled for reporting purposes.

As shown in Exhibits 5 and 6, all participants in every school site showed increased pre- to post-test scores on the LAS/BEST. The median gain across all participating sites was 28 points, on a 100-point scale. The average starting point was 38 and the average finished at 66.

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Exhibit 4: Learning Effects Across Sites (N=4)

	Often	Sometimes	Seldom
SHORT-TERM RESULTS			
1. Program generates learning	1	3	
2. Supplements increase learning	3	1	
3. Attributed outcomes			
time on task	3	1	
independence	3	1	
motivation	4		
cooperative learning	3		1
LONG-TERM RESULTS			
1. Productivity indicators			
access to learning	3	1	
increased contact time	2	2	
learning alternatives	4		
2. Improved self-esteem	3	1	
3. Increased socialization	2	1	1
4. Language acquisition	3		1
5. Staff satisfaction	3	1	
6. Stronger agency commitment	3		1
7. Increased teacher collaboration	3		1
IMPLEMENTATION EFFECTS			
Classroom Organization			
1. Supportive access to computers	3		1
2. Convenient location of computers	3		1
3. Appropriate mix of computers	3	1	
4. Computer/assistive device compatibility	3	1	
5. Effectiveness of ESL Supplemental Software	3	1	
Support Elements			
6. Effectiveness of supplements	3	1	
7. Adequacy of equipment	4		
8. Available administrative support	4		
Management/Leadership			
9. Teacher motivation	3		1
10. Adequacy of training	4		
11. Administrative priority	4		

Exhibit 5: Pre-Post Mastery (LAS/BEST) Comparisons by Student Within Site

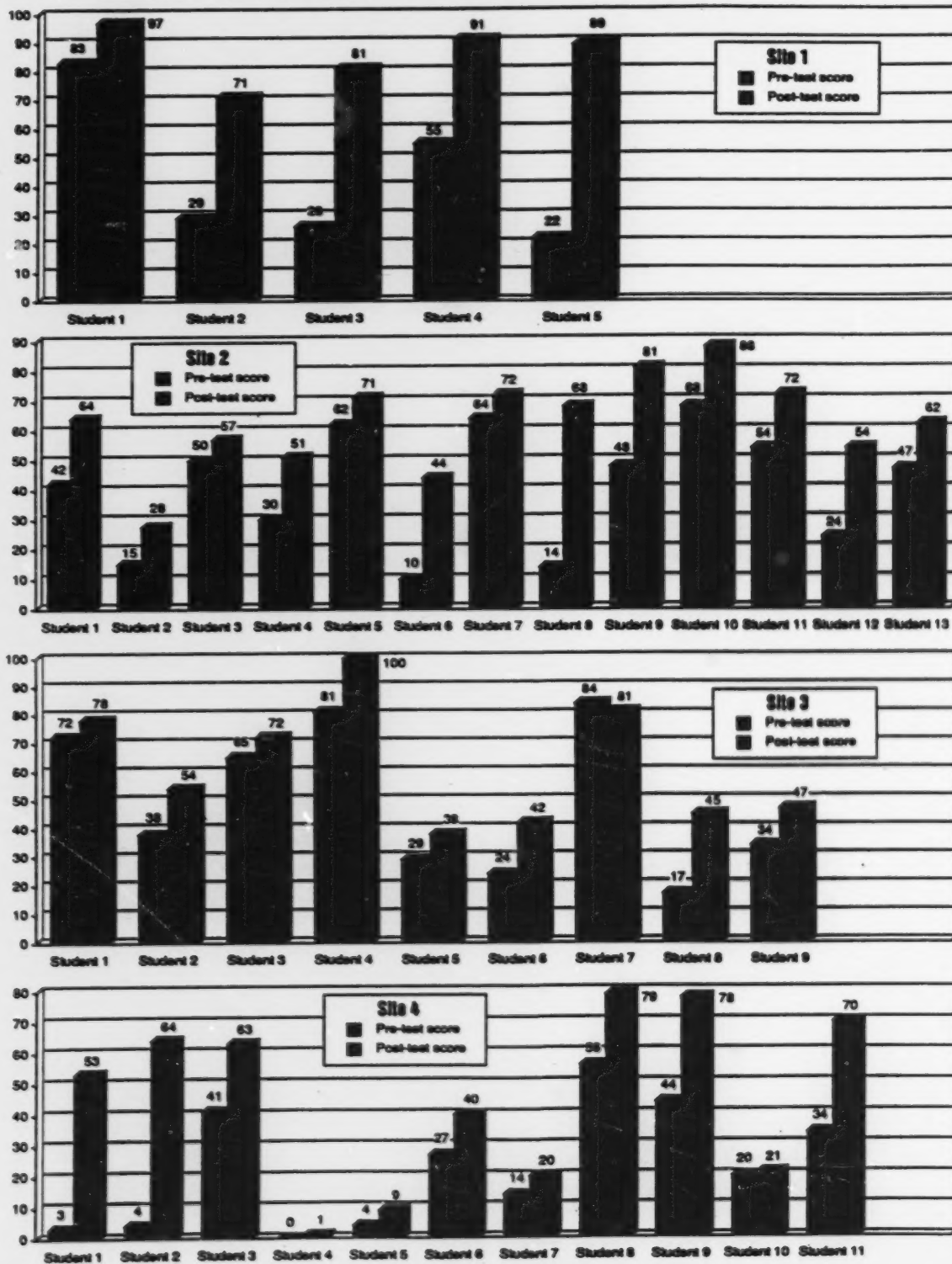
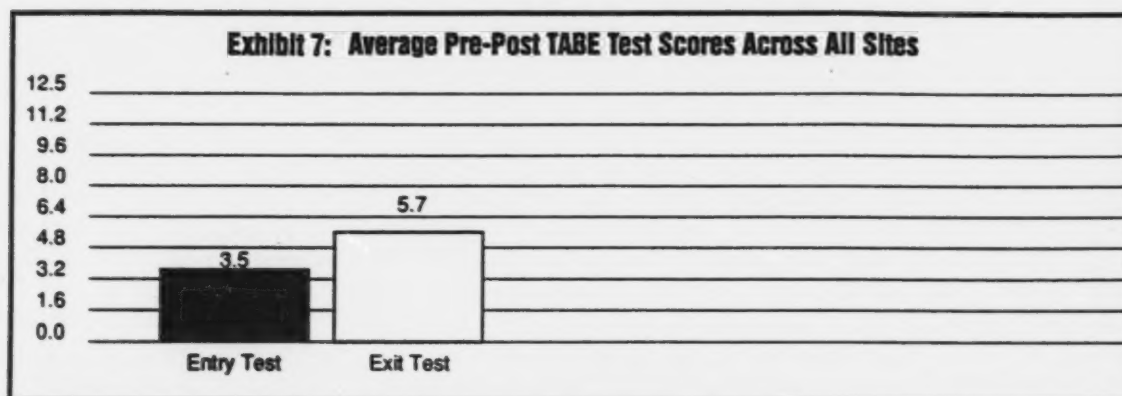


Exhibit 6: LAS/BEST Pre-Post Test Score Comparisons By and Across Sites			
By Site	Median Scores (Perfect=100%)		
	Pre-Test	Post-Test	Point Increase
1	29	89	60
2	38	54	16
3	20	53	33
4	47	66	28
Across All Sites	38	66	28

The first and third project sites showed average median score increases of 60 and 33 points, respectively. These gains are enormous leaps for language-deficient learners. Exhibit 5 shows that all but one project participant grew -- most of them by more than 20 points -- within no more than 60 hours of instruction. In a couple of the sites, students started the project at a higher level; even in these cases, the students grew proportionately about the same as their peers at other sites who started at lower entry points.

One measure of the overall language gains of older youth and adults is the Test of Adult English Skills (TABE), which was administered in one site to all learners at the beginning and end of the study period. The TABE, a widely used, standardized measuring instrument, assesses general reading comprehension and vocabulary skills. Standardized on out-of-school aged adults, the test measures grade-level gains in language skills.

As shown in Exhibit 7, when pooled across all project sites, the grade level scores among project participants jumped from an average grade level in reading of midway through third grade up to midway through fifth grade in about 60 hours of study. Generally speaking, these results indicate that project learners progressed at about twice the speed students would have progressed in school, given the same level of English entry skills.



Although these results are remarkable, it cannot be assumed that this same rate of learning would necessarily continue beyond the project period or that the increased level of English proficiency will necessarily be maintained by project participants. The fact that learning occurred, and occurred quickly throughout the project, is clear, notwithstanding, and the project activities and supplementary multimedia -- along with excellent teachers and highly motivated learners -- certainly deserve credit.

Exhibit 8 shows comparisons of students with learning disabilities at two project sites to a group of randomly selected students without disabilities. The students without disabilities took CCP/ESL one year earlier without access to the assistive devices and supplementary software used within this project.

Due to the nature of language learning difficulties faced by special education students, one would expect students with disabilities to:

- enter activities at a lower functioning level than peers without disabilities (indeed, project participants were selected on the basis of their low functional levels);
- take a longer amount of time to master skills than peers without disabilities;
- complete less work overall than peers without disabilities; and
- achieve lower post-test scores than peers without disabilities.

Exhibit 8: Instructional Levels Completed Students With Learning Disabilities vs. Students Without Learning Disabilities						
	Students With Learning Disabilities Project Site 1 (n=15)		Students With Learning Disabilities Project Site 2 (n=15)		Students Without Learning Disabilities Non-Project Sites (n=44)	
	n	%	n	%	n	%
Level 1	5	33%	1	6%	10	23%
Level 2	3	20%	3	20%	11	25%
	Roughly	50%	Roughly	25%	Roughly	50%
Level 3	5	33%	5	33%	14	32%
Level 4	2	12%	6	40%	9	20%
	Roughly	50%	Roughly	75%	Roughly	50%

Exhibit 8 shows just the opposite to have occurred. The proportion of students with disabilities leaving the CCP/ESL special project at one of its two top levels (Level 3 or 4) was the same or a little greater than their counterparts without disabilities (at least half). As seen in Exhibit 9, it took the learning disabled groups somewhere between five and nine hours to complete an instructional unit of study, whereas it took their counterparts without disabilities about eight hours. So, again, there is no appreciable difference due to handicapping condition.

Within a level of study (about eight units comprised a level), neither group tended to complete every single unit of study within a level. Both groups left a level of study having completed about half or more of it. This result is probably not due to their inability to complete the work, but rather to teacher judgment having promoted them to the next level of study.

Exhibit 9 also displays the post-test scores for students with and without disabilities, with no appreciable differences to note on this variable either. Both groups showed mastery levels of 80 percent on the covered instructional objectives; in fact, one of the learning disabled groups showed an average post-test mastery level of 90 percent, an even higher level than their counterparts without disabilities.

Exhibit 9: Hours and Mastery Levels of Students With Learning Disabilities vs. Students Without Learning Disabilities			
	Students With Learning Disabilities Project Site 1 (n=15)	Students With Learning Disabilities Project Site 2 (n=15)	Students Without Learning Disabilities Non-Project Sites (n=44)
Median Average Hours per Unit (Total Units=8)	9	5	8
Range of Hours Per Unit	2-33	1-9	1-22
Number of Units Completed	3 of 8 or 40%	6 of 8 or 66%	5 of 8 or 60%
Mastery Score Per Unit	80%	90%	80%

Without evidence to the contrary, one could justifiably speculate that the special project, with rich use of a wide variety of reinforcing instructional strategies and products including multimedia computer activities, enabled students with learning disabilities to keep up with their non-disabled counterparts. Although strict control groups were not established, nor meant to be studied as part of this project, a cursory glance at summary measures of comparative results show no appreciable differences between the groups, regardless of whether they had learning disabilities over and above language deficiencies.

Correlation does not imply causation, so there is no proof that the special project supplements served as the "great equalizer" between disabled and non-disabled learners, but there is a definite positive relationship between use of project supplements by students with disabilities and ability to learn essentially the same amount in about the same time as learners without disabilities.

Another explanation for the "no difference" finding between the group with limited English proficiency and the group with learning disabilities could be that language deficits for non-English native speakers are just as disabling for adults as are intellectual or sensory impairments.

J. RECOMMENDED CHANGES FOR SUCCESSFUL REPLICATION

The only suggestion for future use of project learning materials that was raised repeatedly, and by more than one teacher, was to simplify instructions. Other recommendations, mentioned by no more than one teacher each, included providing more transition activities (e.g., writing exercises) between topics covered in the computer activities, and to add more off-line individual and group activities that parallel and reinforce the work required by the computer.

A list of all suggestions made throughout the course of the project is contained in Exhibit 10. Because teacher opinion did not cluster around an isolated set of revision recommendations, it can be assumed that similar learning results could be expected without any appreciable changes in the revised (as a result of the project) program's content or procedures.

Exhibit 10: Recommended Changes for Successful Replication				
Suggestions	Frequency of Mentions			
	School 1	School 2	School 3	School 4
1) Provide easier student instructions	1		2	
2) Provide transition activities between topics	1			
3) Correlate related reading, speaking, and writing activities; place them together on the computer	1			
4) Provide more writing activities through the computer	1			
5) Increase print activities that parallel computer instruction	1			
6) Add off-line activities as transition between Optimum Resources exercises and routine reading of print text		1		
7) Provide plenty of individual student work space, separate partitions if possible to prevent distractions	1			
8) Such language work should be scheduled in two hour blocks of time		1		
9) Add modules to speech viewer to assist pronunciation problems of different language groups				1
10) Project STAR materials need a restructured introductory section to motivate students with shortened vocabulary work and shorter amounts of reading to occur earlier in the material				1
11) Within a revised CCP program, use functional vocabulary, with important topics such as going to the doctor, to teach sound/symbol connections. Students with weak visual and short-term memory need a program to teach decoding skills				1
12) Job-related software would be a good addition in any language acquisition program				

V. CASE STUDIES

As part of the project's evaluation component, a total of 19 students at the four sites were studied in depth. Like all participating students, these learners were tested with the LAS/BEST and/or TABE. Each of these students was also observed periodically during the course of the study. Appendix G presents summaries of the observations for each of the 19 learners. It should be noted that student names have been replaced with codes keyed to each site (A - Arlington, H - Hillsboro, and W - Worcester).

VI. MARKETING PLAN

The products and product modifications used in this project have proven to be valuable enhancements to the U. S. BASICS ESL learning center, which will expand the market for the center and the products. In this chapter, we detail U. S. BASICS' plan to integrate the study's findings regarding supplemental products into a marketing plan.

A. IDENTIFICATION OF TARGET MARKETS

The experience of project sites suggests that the market for the products used in the project is larger than originally anticipated, a finding that echoes what other developers and users are discovering about these products (Greenfield, 1992). In addition to the originally-defined population of limited English proficient (LEP) learners with special needs, particularly learning disabled, the project indicates that the ESL learning center configuration has potential applicability to several broader target populations, including LEP adult learners, LEP at-risk youth, and LEP learners in general. Thus, the potential population to be served by this program is large; at a minimum, the LEP population who are functionally illiterate in their national language and have learning disabilities is about four million.

U. S. BASICS has also identified the larger general universe of relevant service providers, as well as current CCP users. U. S. BASICS will identify strategies needed to market to each target group, including the following: identify special expertise needed for selected market segments; estimate U. S. BASICS' potential market share given its current resources and capabilities; identify U. S. BASICS supporters involved with identified market segments who can facilitate the marketing process, including external field agents and associates; and determine what promotional initiatives are necessary or desirable.

B. PACKAGING: CONFIGURATION OPTIONS AND VARIABLES

To develop a marketable package, U. S. BASICS will apply the dual strategy which it currently uses for its other CCP products, that of developing specific lab configurations for primary target groups based on an "a la carte" price list of all ESL components. The strategy of offering specific pre-packaged lab configurations appeals to potential clients who prefer ease and convenience or who have less experience in assembling their own program; whereas offering an "a la carte" price list of all ESL program components appeals to those clients who want to choose their own customized lab configuration.

A key variable in the marketing process is the specific set of learning center configurations selected. Most of the third-party vendor materials could be included as part of an overall package; however, some of the materials are likely not to be included, either due to high cost or to lack of suitability for a sufficiently large market segment.

There are literally dozens of configuration options which could be chosen to develop a marketable package. However, several likely options suggest themselves. The most promising option combines the existing CCP ESL program with vendor materials available as add-on packages for each CCP ESL "course".

The third-party vendor materials used in the project with the CCP ESL program can be divided into three categories. Some of the materials have discrete, definable objectives that were readily compatible with the CCP ESL curriculum sequence. These materials include Davidson's *English Express*, *Q-Solution*, *Breakthrough to Language*, and *MicroLads*. These materials would be relatively easy to bundle into add-on packages. Other materials have independent curriculum sequencing which present capability problems with the CCP ESL curriculum sequence. Products in this category include *Lexia*, *Project STAR*, and *Optimum Resource's Reading Program*. In some cases, these materials were referenced into CCP ESL as "course review" rather than into specific lessons. *Optimum Resource's Reading Program* has the drawback of being relatively expensive and is still being "beta tested" in sites across the country. A third group of materials function best as supplemental "tools" for

instructional delivery. Materials in this category include the IBM *SpeechViewer*, the Franklin English-Spanish electronic dictionary, *Talk to Me*, and *Eye Relief*. These materials might best be marketed as separate add-ons to various bundled packages.

In addition, some products would be most suitable for certain target populations rather than others. For instance, the Lexia program would be suitable for school-age learners rather than adult learners, while the Franklin dictionary would obviously be suitable only for Spanish-speaking learners. Thus, U. S. BASICS will analyze these factors as well as determine which combination(s) of materials would be most suitable for the identified target populations.

C. "COMPRESSED" CCP ESL AND OTHER PRODUCT REFINEMENTS

As noted elsewhere, several product refinements were made based on the project experience. For example, improvements to the *Talk to Me* program's file structure drastically decreased the loading time required, while alteration of the Lexia program's branching mechanism was utilized to accommodate the CCP ESL program more readily.

Product refinements were also made to the CCP ESL program itself, as some of the project sites took advantage of the CCP ESL program's suitability for allowing "customizing" in local sites to make the program more amenable to their needs. One project site in particular (Hillsboro) revised its CCP ESL curriculum, "compressing" their existing CCP ESL program into a smaller number of lessons with functionally-based content and cross-referencing academically-oriented activities into the functional lessons. The resulting "Compressed CCP ESL" package offers several potential advantages: a more compact curriculum might be more attractive to market and more manageable for its users. On the other hand, the resulting package is likely to have less appeal for potential clients who want a more academically-oriented curriculum. Also, although this project funded a substantial share of this product revision, including competency framework and progress tracking development, creating the entire product is more accurately described as product redevelopment rather than product refinement.

Consequently, another possible set of configuration options would combine "compressed" CCP ESL (instead of the existing CCP ESL) plus selected vendor materials. However, because of the extent of the work involved in enacting the "compressed" CCP ESL, additional resources would have to be secured to pursue this option. Accordingly, U. S. BASICS will explore the possibility of procuring funding, either from participating vendors or from outside sources, in order to enact this option.

In addition to product refinements and modifications that were incorporated into site programs during the course of the project, project sites also made a dozen additional recommended changes for successful replication. Many of these additional recommendations involve improving program operation (e.g., "provide plenty of individual student work space") or potential program enhancements (e.g., "increase print activities that parallel computer instruction"). These recommendations will be incorporated into subsequent design efforts to the extent possible, for instance by including them in product support materials. Only one of the dozen recommended changes was mentioned more than once or by more than one project site: "provide easier student instructions". This recommendation is being incorporated into program revisions currently underway by U. S. BASICS and its research and development partner, the Remediation and Training Institute. This and other curricular improvements will be made and incorporated into the CCP ESL program when development work is completed, currently projected to be sometime in early 1993.

D. PRICING AND COORDINATION WITH OTHER VENDORS

U. S. BASICS is currently planning the process of developing appropriate distribution arrangements with other project manufacturers. The agreements to be negotiated will reflect the final configuration options chosen and will likely vary somewhat from manufacturer to manufacturer. Among the types of arrangements being explored are U. S. BASICS serving as a value-added retailer on behalf of the manufacturer or vendor. Another arrangement being explored is a joint marketing relationship among U. S. BASICS, the manufacturer, and their distributor.

VII. SUGGESTED ENHANCEMENTS TO THE CCP/ESL PROGRAM
TO BETTER MEET THIS POPULATION'S NEEDS

The CCP/ESL Program was not developed for ESL and LEP adults with handicapping conditions. Several attributes of the program, however, made it a sound choice as the core program for this study. The CCP/ESL Program has been widely distributed as an adult and secondary school ESL program and, thus, is well established and accepted in the field. The effectiveness of the program for LEP populations has been well documented. Since the CCP/ESL Program was not designed for handicapped individuals, it lent itself to being supplemented by software and technology-based materials which were designed and developed for audiences not specifically targeted by the CCP/ESL Program.

The sites participating in this study identified areas in the CCP/ESL Program which could be strengthened or further developed to better meet the needs of LEP and non-English-speaking adults with handicapping conditions:

- incorporating a more multi-sensory approach;
- providing opportunities for more whole language and language experience activities;
- facilitating structured collaborative and cooperative learning experiences;
- offering methods for personal and private practice and feedback in auditory discrimination and pronunciation skills;
- providing more visual stimuli for visual learners;
- developing an on-line diagnostic and prescriptive tool internal to the program which would enable learners to work at their own pace with less supervision;
- reinforcing on-line reading activities with more off-line activities, thereby providing new contexts for learning;
- using large-letter text for the text materials;
- revising the CCP Academic Strand grammar and reading lessons to make them more appropriate for the lower functioning learners; and
- developing a more integrative approach so that information is reinforced through writing, auditory, and visual activities.

The software selected as supplementary programs were also not designed specifically for this population. Some programs were developed for individuals with handicapping conditions, but not necessarily adults or LEP/ESL. Other programs were designed for low-functioning, but not ESL/LEP, adults. Still other programs were developed for ESL instruction but not necessarily adult or handicapped individuals. Thus, this study focused on which products were effective for the target population as developed, which were effective if modified or implemented a certain way, and which were inappropriate. Sites using the supplementary products cited these strengths and weaknesses of each for meeting the needs of adult non-English-speaking or limited English proficient adults with handicapping conditions.

A. IBM SPEECHVIEWER

1. STRENGTHS:

- Enabled students to work at pronunciation in private as well as independently at their own pace.
- Flexible enough in design to enable two or more learners to use activities at once and thereby to profit from a collaborative experiences on the computer.
- Involved multiple modalities.
- Permitted learners to interact with content and to practice skills in a variety of contexts, using diverse approaches.
- Afforded students the opportunity to further reinforce vocabulary and concepts which were introduced in the CCP Program.
- Provided the practice necessary in order to improve speech and pronunciation problems and did so in a highly interactive and engaging manner.
- Motivational aspects of the activities made learners eager to return to the program frequently and thus encouraged them to engage in activities for longer periods of time and more often.
- Provided for interactive improvement of speech problems.

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2. WEAKNESSES:

- Documentation could be more directive in suggesting collaborative and cooperative activities for learners to engage in.
- Implementing the program was difficult in one site because the CCP hardware was in conflict with the *SpeechViewer* hardware.
- Failed to address certain common articulation problems (i.e., differentiating between /l/ and /r/, /s/, and /sh/, /v/, and /b/, /d/ and /th/.
- Program was not sensitive enough to mispronunciation of final consonant sounds.

B. ENGLISH EXPRESS

1. STRENGTHS:

- Provided a powerful, multi-modal means of reinforcing new skills which were introduced via the CCP/ESL audiotapes.
- Provided self-paced, private feedback on oral skills while enhancing auditory discrimination skills.
- Helped students overcome an inability to vocalize in front of others while it helped build self-confidence by offering a "safe" way to practice and improve oral skills.
- Offered an alternative approach to reinforcing the vocabulary introduced in the CCP Program through the laserdisc portion of *English Express*.
- Enabled learners to work with vocabulary in a variety of ways in order to build self-confidence and retention.
- "Zap It" activity from *English Express* was particularly useful in enhancing concentration by holding the students' attention and thus effectively contributed to the growth of vocabulary, comprehension, and retention of material.

2. WEAKNESSES:

- Time-intensive if program is to be effectively implemented.

C. MICRO-LADS

1. STRENGTHS:

- Further enhanced and supported grammar, punctuation, and writing skills.
- Proved especially effective to use this program with the students to better prepare them to handle print materials.

- Proved useful in developing the student's sense of English sentence structure.
- Increased students' skills in recognizing phrases and English words.
- Accelerated mastery of prepositional phrases.

2. **WEAKNESSES:**

- Solid and motivational practice in identifying grammatical patterns but weak in challenging students to generate their own examples and in helping the students understand the grammatical structures in other contexts.

D. **CREATIVE LEARNING**

1. **STRENGTHS:**

- Highly effective approach for developing a sense of English sentence structure.
- Multi-sensory.
- Excellent reinforcement for activities with content using *English Express*, *Q Solution*, and CCP reader cards.

2. **WEAKNESSES:**

- Examples were more elementary and not closely tied to "adult" experiences.

E. **TOUCHWINDOW**

1. **STRENGTHS:**

- Motivational and helpful.
- Made programs more accessible for students, especially those functioning at the lowest levels.
- Enabled the student to progress faster at the outset while it helped build self-confidence and created a comfort zone for using computers.

2. **WEAKNESSES:**

- Difficult at times to keep calibrated, so students became frustrated when the calibration was off.

F. **STAR**

1. **STRENGTHS:**

- Clean screens and carefully structured lessons of this program provided students with a wealth of reinforcement using a variety of modalities and in a variety of subject areas: vocabulary, spelling, usage, and writing.

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- Lack of distractions and the interwoven nature of the content presentation made the program highly successful with this audience.
- Assisted with the acquisition of vocabulary skills by further reinforcing the CCP program's approach but in a variety of modalities.
- Structure of program motivated students to repeat lessons until they received a perfect score on each lesson.

2. WEAKNESSES:

- Some students found the grammar/usage portion of the literacy tier difficult, even as a reinforcer of material encountered in such programs as *Micro-LADS*.

G. BREAKTHROUGH TO LANGUAGE

1. STRENGTHS:

- Multi-sensory approach to building skills and understanding in grammar, particularly effective with students who needed a great deal of visual stimuli.
- Involved multiple modalities.
- Strengthened vocabulary and reinforced letter recognition.

H. LEXIA

1. STRENGTHS:

- Provided motivating practice in decoding skills, an area of particular weakness for many of the learners in the study.
- Broke the decoding skills into easy-to-understand parts and embedded practice in highly engaging activities.
- Using a game format and small steps created a highly effective and non-threatening environment for low-functioning learners.
- Adults did not find that this program "talked down" to them as they felt other programs addressing decoding skills did.

I. EYE RELIEF

1. STRENGTHS:

- Flexibility of the program enabled the combining of writing with basic vocabulary study.
- Permitted learners with visual problems greater access to writing as a form of communication and expression.

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- Provided an important reinforcement and balance for improving reading skills.
- Supported a "Keystrokes to Literacy" approach, especially for those learners for whom regular font size would be difficult to read on the screen.
- Flexible enough to be used for a variety of activities, such as creating cloze lessons on the program and using it for language experience activities.
- Provided a powerful tool for visual learners.

J. TALK TO ME

1. STRENGTHS:

- Instructors can create their own multi-modal lessons, using their own voice as a model and focusing on words that have immediate application to the student.
- Students could vocalize to hear their own speech and could evaluate their own pronunciation in comparison with the model.
- Could better target individual student speech problems with teacher-made lessons.

2. WEAKNESSES:

- Came with limited content as an example of the types of activities which an instructor could input using the program.
- Time-consuming to create lessons from scratch.

K. Q SOLUTION

1. STRENGTHS:

- Reinforced the category words in written and reading activities provided primarily in the *Q Solution* materials.
- Worked well for paired learning activities.
- Encouraged vocabulary development and the need to talk.
- Portable enough to take home for further off-line reinforcement.

2. WEAKNESSES:

- Expensive.

L. FRANKLIN TALKING DICTIONARY

1. STRENGTHS:

- Freed-up teacher time from having to define words for students who otherwise had to wait for teacher-provided definitions.
- Offered further auditory reinforcement. The use of the multiple approaches worked extremely well with these students.
- Students benefited from being able to work with vocabulary in a variety of contexts.
- Offered a variety of stimuli and a great deal of reinforcement.
- Easy to carry and take along as a personal "tutor".

2. WEAKNESSES:

- Easily stolen (missing units were frequently returned).

M. OPTIMUM RESOURCE READING PROGRAM

1. STRENGTHS:

- Interactive verbal capability of program furthered students' learning by emphasizing a phonetic approach.
- Emphasis on phonological process was highly effective for certain learners who were not progressing as well using other approaches.
- Provided additional arena for practicing pronunciation skills.

2. WEAKNESSES:

- Lack of generalization by some students of skills and information gained on the *Optimum Resource Reading Program* (i.e., being able to imitate the model while on the program but then not be able to carry this over into everyday speech).
- One student with attention deficit disorder refused to use the program. The instructor hypothesized that the lessons were too long to hold this learner's attention and the screen design was such that the learner could not focus on the instruction. Thus, the learner was frustrated when on the program because there was no closure and he/she could not adequately focus attention on learning.

VIII. RECOMMENDATIONS FOR FURTHER
RESEARCH AND DEVELOPMENT

When the project was originally proposed in 1990, our review of the literature on technology use with LEP populations who also have learning and other disabilities found only a handful of published research addressing this population. Since that time, published research in this area has grown very little, with the exception of the articles, speeches, etc. resulting from this project. Although the interest of the research and technology community in the topic has grown, as evidenced by several directly-related topics discussed during the recent OSEP Research Project Directors conference, the number of projects addressing the use of technology with this target population has not increased. In the meantime, the nature and extent of the problem has grown. Over the last six years, the number of LEP participants enrolled in adult basic education has nearly tripled. According to the Bureau of Census, between 1980 and 1990, the number of families in which languages other than English are spoken in the home has increased from 11 percent to more than 15 percent. The percentage of functional illiterates who also have learning disabilities has increased to between 50 and 80 percent, a clear indication of the inadequate treatments provided to these individuals before they dropped out of school. We estimate that the total population of functional illiterates who have limited English proficiency and also learning disabilities is about four million individuals.

Given the magnitude of the problem and the current low priority placed upon applied research and development on the use of technology with this target population by the U. S. Department of Education, we strongly urge USED to redirect its priorities and provide support in several areas identified below, which build upon the exploratory research findings of this project.

A. DEVELOPMENT OF SUPPLEMENTAL MATERIALS/GUIDES

None of the publishers/vendors whose products were demonstrated in this project have adequate incentives to allocate their own resources to the development of supplemental materials designed to make their products suitable

for LEP learners with disabilities. They have indicated that: (1) the specific market is too "thin" to cover the risk, uncertainty, and cost; and (2) the most effective use of their products were always in conjunction with other complementary products which would require costly co-development marketing relationships.

USED/OSEP is the most likely source of funding and other support for such product enhancements.

B. APPLIED RESEARCH

As a result of this exploratory research project, we strongly urge that two areas of applied research be given priority attention.

The first new area would be a focus on early childhood/intergenerational learning with the target population being preschool LEP students, who have early diagnosed learning problems, and their parents, who are often illiterate. The rationale for this focus includes:

- No large-scale Federally-funded research has been conducted on the use of emerging new technologies with this target population.
- Both the Administration and Congress have placed a general priority in this area, although the specific target population has been ignored.
- In the last year, new advances in low-cost visual- and audio-based technologies have created new opportunities (e.g., CD-ROM, CD-I).
- The potential benefits beyond special education to other expanding programs -- such as Even Start, Chapter 1 preschool, and Head Start -- could also be great.

Another new focus of applied research would be upon LEP populations who have disabilities other than special learning disabilities, including sight and hearing impairments. Only a small number of individuals with these disabilities participated in this project. The demonstrated effectiveness of products such as *SpeechViewer* and *Eye Relief* with individuals with these impairments, as well as those with learning disabilities, indicates a high probability of success and is a fertile area for exploratory research in the future.

In any new efforts to conduct exploratory research, either case studies or a "naturalistic approach", the experience of this project strongly suggests that the "treatment" should be the **family of supplemental technologies or cluster** used with the participant. Any attempt to partial out the effects of **specific individual supplemental technologies** will be extremely difficult because such technologies are usually used in combination with other complementary technologies for students whose learning modalities may differ significantly from individual to individual. This type of research was addressed during the July 1992 OSEP Research Project Directors Conference.

C. DEMONSTRATE THE BENEFITS OF TECHNOLOGY

A third important area for future research and development is the demonstration of benefits of new, emerging technologies with LEP populations who have low functional levels in their native languages and who have one or more learning or other disability. In the K-12 market, the most rapidly growing technology format, in terms of installed base, is the CD-ROM. Although most of the installed base is in libraries and media centers, the number of CD-ROMs is rapidly growing in classroom environments as more and more instructional, as opposed to reference, CD-ROM programs are developed. In many cases, CD-ROM versions of computer-based software are becoming available (e.g., Sierra-on-Line's *Mixed Up Mother Goose*). Because CD-ROM programs provide vivid visual information, which appears to be more effective than computer-generated graphics used in traditional software, the use of this technology format in applied research in preschool/intergenerational programs would also offer significant promise.

APPENDIX A

LITERATURE REVIEW

DRAFT

Literature Review

The current research base and published literature on the use of technology with bilingual and limited English proficient (LEP) populations with disabilities is extremely sparse. In part this may reflect the lack of interest before the early 1970s in bilingual and limited English proficient populations with disabilities. Bilingual and LEP special education evolved as a recognized area of emphasis in the early 1970s from concerns that minority students were being misdiagnosed in special education. In its 1969 and 1970 reports, the President's Commission on Mental Retardation labeled the misdiagnosis of minority children the "Six Hour Retarded Child." With the filing of *Diana v. California* (1970) in federal court, the American judicial system began to closely exam special education placement of minority students. In 1973, Mercer published the classic empirical study on the misdiagnosis of minority group students in special education in the book Labeling the Mentally Retarded. The growing concerns in bilingual special education culminated in 1974 with the publication of a special issue of Exceptional Children on cultural diversity, "Special Issue: Cultural Diversity" (Bransford, Baca, & Lane, 1974); and with this special issue, the area of bilingual special education gained much needed professional recognition.

Although this 1974 issue of Exceptional Children illustrated a new sensitivity to culturally and linguistically different exceptional students, the journal provides only limited insight into the problems of minority group students and special education. Articles tended to focus on issues of misdiagnosis and assessment or on the efficacy of teachers' accepting and even valuing students' linguistic and cultural differences. Gonzalez (1974) and Bryen (1974) offered many alternatives to traditional special education assessment methods to insure a more accurate diagnosis and placement of linguistically and culturally different students. Diggs (1974) argued for community and parent involvement in the education of these students,

increased cultural sensitivity on the part of teachers, and enhanced teacher preparation to better accommodate culturally different students. Other articles examined issues of gifted education and the need on the part of teachers to recognize that no one language is superior to another. The articles focused more on philosophy than on providing educators with a clear understanding of if and how instructional methods and materials should be structured differently for minority group special needs students.

Throughout the intervening years, the literature continued to focus more on issues of misdiagnosis and inappropriate assessment instruments than on determining if the materials and methods that are effective with dominant group special education populations need to be adapted or changed in order to better meet the unique needs of bilingual and limited English students in special education classes (Arter & Jenkins, 1979; Cummins, 1984; Rueda, 1989; Reynolds & Salend, 1990). Tucker (1981) also cited problems with misclassification of bilingual and other minority special education students; however, the author listed among the issues of Mexican American special education the limited availability of instructional materials.

Esquivel & Yoshida (1985) have suggested that minority group students may have learning styles that do not fit in well with the way in which many teachers conduct instruction in the classroom. Rodriguez (1988) noted research that suggests that minority group, bilingual students do exhibit different learning styles and cognitive development from students from the dominant group. They report, however, that "at present, comprehensive, evaluated programs taking these factors into account have not been developed or proven effective for minority group children. With few exceptions, minority group exceptional children remain underserved (p. 5)."

Similarly, Tierney and Yopp (1990) attempted to develop and validate a test of diagram interpretation in order to then investigate how cultural soundness effects students' interpretations of chalkboard diagrams. The six most common diagrams--pyramids, bar graphs, vertical and horizontal arrows, timelines, organizational charts, and Venn diagrams--were used to develop the test. The results showed significant differences between the scores of Anglo and Hispanic students, indicating that cultural and social issues may affect minority students' reactions to visual imagery. The conclusion suggests that the overall value of aids to memory may be

influenced by cultural or intellectual factors, making it crucial for teachers to be sure to check understanding with multicultural and multilingual students.

As with much of the previous research in this area, Leung (1990) investigated the risks that culturally and linguistically different students face when they enter formal education. Among these the author cites the risks to self-image because of the student's physical, cultural, and linguistic differences. In addition, the author found that these students may be perceived as language delayed because of the monolingual nature of the American classroom. This can cause communication problems that plague the child throughout his/her formal education. If these linguistic differences are not addressed early in the child's formal education, the student accumulates social and academic deficits that eventually may result in failure and drop out. Many students must also face acculturation and identity dilemmas because of these problems that are only exacerbated by insensitive and uninformed significant others who may misdiagnose cultural differences as disorders. Leung concluded that teachers must work to match teaching-learning activities with cultural preferences of students and must pay close attention to multicultural differences.

Physical handicaps create an additional obstacle to learning for physically disabled students (Fewell & Sandall, 1983). Hearing impairment has a negative impact in the language area. "Vocabularies are much smaller and more concrete, sentences shorter and less complex, and errors in grammatical structure (such as omitting plurals, tenses, possessives, ...) characterize the hearing impaired child's language (Lowenbraun & Thompson, 1982, p. 59)." Myklebust (1964) reported that deaf high school seniors to have reading vocabularies at the level of nine-year-olds. Williams & Vernon (1970) conducted a study of 93% of the deaf students over 16 years of age in the United States and found that 60% were below grade level and 30% were functionally illiterate. Little research has examined the additional effects of limited English proficiency on hearing impaired students, nor is there any data on the use of assistive technologies with LEP hearing impaired students. Other characteristics commonly noted in disabled children include deficits in the areas of attention patterns (Fisher & Zeaman, 1973), iconic memory (Galbraith & Gliddon, 1972), and short-term memory (Mosley, 1980).

Little data exist on the use of technology with physically and developmentally disabled children and adults. The data that do exist emphasize the need to embed language and classroom activities in the concrete, everyday language and experiences of the students (Figueroa, Fradd, & Correa, 1989; Ruiz, 1989; Meisels, 1985; Esquivel & Yoshida, 1985). Bear & Cheney (1991) report on the success of a program for LEP, disabled students that stresses whole language approaches and places a heavy emphasis on writing to enhance literacy skills. Cummins (1986) cited studies of learning disabled students that suggest that bilingual students gain competence and confidence in the classroom where there is ample opportunity for expressive writing. Much of the literature and research identifies writing as a powerful tool for enhancing the learning of both bilingual and IEP populations as well as Bilingual and LEP students with disabilities. Esquivel & Yoshida (1985) found that student gains in achievement for LEP and Bilingual disabled students were directly related to the amount of verbal interaction they experienced.

The actual literature on the use of technology with this population is thin. What literature there is addresses technology and the disabled student, not the disabled, LEP, early childhood student. Gall, et al. (1989) suggest that a "technology-based curriculum would provide a motivating, multisensory learning environment while allowing students to begin to participate actively in the learning process (p. 54)." Parette & VanBiervliet (1990) indicate that appropriate technologies can help children ages 3-21 be more independent, learn more in educational settings, increase their employability and productivity, and enhance self-fulfillment.

Haile (1990) reviewed the research on the effectiveness of CAI with special emphasis on the uses of technology with culturally diverse students. The author found that for older students and adults, telecommunications, where students can practice and enhance language skills both in their native language and in English seems to show the most promise. She concluded that educators must exploit computers in a variety of ways in instruction and not focus on one to two applications. Haile cautions that teachers must be more sensitive to developing computer implementation strategies that take into account particular classroom cultures. They must also be alert to cultural "mismatches" where students from certain backgrounds and cultures are not comfortable with certain computer programs because they require that the

students behave in ways that are inconsistent with the student's values, preferences, and experiences. Haile stresses that educators need to gain greater insight into how and why CAI works and with whom and under what conditions.

In the CAELL Journal, Ching and McKee (1990) examine integrating computers into a basic writing curriculum for bilingual and LEP students. Despite earlier research which questioned the value of computer use for writing by ESL and basic writers, the authors developed a model for using a computer writing lab as an integral part of composition classes which target ESL and basic writers, designated as "at-risk." Although developed at the university level, the program suggests applications for writing programs at the secondary through university levels. The program employs a two-part model: Classroom instruction, using the writing process approach with emphasis on prewriting and revision; and two hours minimum per week in the writing lab, one scheduled and the other one open. Students in the writing lab were under the supervision of tutors who act as writing tutors as well as an audience for the writing, helping the students understand that revision is more than cosmetic and aiding them in the transition from oral expression of ideas to more formal academic writing. Student evaluations of the program indicated that a majority of the students found the program helpful, thought the word processor made writing easier, and felt that they were more willing to revise because of the use of the word processor.

Yoshida (1990) studied the use of guided computer-generated peer feedback as an effective method of helping advanced ESL students in a university setting enhance their writing and thinking skills. Students provided reactions to the writing as well as suggesting editing changes. The results indicated that the feedback helped student writers clarify their text through amplification. The growth of student writers through this process was evident in their narrative and process descriptions but not in their later argumentative compositions, perhaps due to the novelty of the process wearing off as well as a lack of the time needed to focus on the more sophisticated argumentative forms. Of the three qualities of effective writing--unity, coherence, and emphasis--emphasis was most enhanced by the computer-generated peer feedback process, and improvement was also evident in the area of unity. Results also indicated that the feedback was more inquiry-oriented than affective and that students focused more on the

message the author was trying to convey. For visual learners, the availability of various fonts and highlighting called attention to effective and ineffective areas in the writing.

Peregoy and Boyle (1990) developed what they term "literacy scaffolds" or temporary frameworks to assist second language learners with reading and writing. The authors explored the use of sentence patterns, patterned books, patterned writing, the use of discourse patterns, directed reading-thinking activities, and story mapping. Peregoy and Boyle (1990) argued that the literary scaffolds that they suggest in the article promote literacy while they enable second language learning.

Boone and Higgins (in press) further explored the idea literacy scaffolds through the use of hypermedia technology. Boone and Higgins found that hypermedia computer-based study guides significantly increased the learning of textual content material for students with learning disabilities. The layered property of hypermedia is used by the researchers to supplement and support textual information. Although the authors do not extend the application of hypermedia textual support to language minority students, the dynamic and immediate nature of the hypermedia computer study guides offer promise for this population and suggest ways to enhance current technology products.

While research is lacking in what, if any, adaptations or changes are needed to make existing special education materials and products more effective with bilingual and limited English proficient special education students, even less attention has been paid to how technology might be used or adapted for bilingual special education. The largest area of exploration in the use of technology with bilingual and LEP populations with disabilities is with writing. The impetus for this might be the number of studies finding positive results in using expressive writing with these populations.

Haile (1990) reviewed the research on the effectiveness of CAI, with special emphasis on the uses of technology with culturally and linguistically diverse students. The author found that the technology that appeared to show the most promise for linguistically diverse special education students was telecommunication, a technology that enables students to practice and enhance language skills both in their native language and in English. She concluded that educators must exploit computers in a variety of ways in instruction and not focus on one or two applications. Haile cautioned that

teachers must be more sensitive to developing computer implementation strategies that take into consideration particular classroom cultures. They must also be alert to "cultural mismatches" where students from certain backgrounds and cultures are not comfortable with certain computer programs because the program requires "behaviors that are inconsistent with the student's preferences, experience, or values, or when the software doesn't correspond with the understandings and thought structures of a particular ethnic or linguistic group" (p. 16). Finally, the author argued that educators need to gain more insight into how and why CAI works and with whom and under what conditions.

In their 1990 article in CAELL Journal, Klassen and Marsh outlined a program, CELT (Computer Enhanced Language Teaching), at City Polytechnic of Hong Kong developed originally as a series of drill and practice exercises for teaching English to Cantonese-speaking students. CELT has evolved into a flexible program that helps students learn strategies for error reduction in their writing. Instructors can edit exercises in the form of diagnostic tests, multiple-choice formats, switch or fill-in-the-blank exercises, and editing exercises which have students identify errors and make corrections. Multiple levels of feedback, explanations for rules, and the possibility of multiple answers enhance the program's use with second-language learners. Feedback is based on research that indicates that second-language learners need to focus on the location of their errors so that they can begin to discern patterns of types errors and internalize the relevant grammar rules. A standardized set of codes for the correction of errors promotes this goal. In an unpublished case study, Persky (1990a) followed for two years a teacher's implementation of technology into her middle school bilingual social studies class, as part of a larger study into what hinders or promotes the successful integration of technology into the middle school curriculum for mildly handicapped students who are mainstreamed. The software packages used were Where in the World Is Carmen Sandiego? and Where in the USA Is Carmen Sandiego? by Broderbund. Over the two-year period, the teacher discovered that her students had difficulty with the content of the program since they lacked the necessary background in geography and prior knowledge. The students were motivated to use reference materials extensively in order to engage in the programs. Furthermore, the more preparation in the area of map

reading and other background skills the teacher provided, the greater the success of the programs with these students.

In a related study in Educational Technology, Persky (1990b) studied the factors that contribute to teacher development in technology. The three-year study examined critical factors at the classroom, school, and organizational levels that support or hinder the successful integration of technology into the middle school curriculum for mildly handicapped students who are mainstreamed. Although 23 case studies resulted, the article chronicled the growth process of an inner-city teacher of bilingual social studies in the integration of technology, her reasons for choosing the software (Where in the World Is Carmen Sandiego?), the supplementary materials she developed to implement the program, and her reflections on the value of the software for her students. Lacking little computer support from the school and no training in computer use, the teacher encountered serious technical difficulties, but the most interesting growth occurred in her shifting perspective on the software. Initially, she simply wanted the students to run the program with no support or interaction from her. Through a series of failures with the program, the teacher changed her goal to be that of not simply running the program but instead using the program as an impetus to writing a research report on a country of the student's choice. Thus, she learned to integrate reference material as well as a word processor and a software program designed to create timelines so that students could shape, draft, and refine their reports. The study found that when implementing technology with special needs bilingual and LEP populations, teachers must activate and integrate their knowledge of their students, the potential contribution of technology to meeting the needs of their students, curriculum content, instructional strategies, assessment strategies, and hardware and software.

Warren & Horn (1987) voice concerns about too heavy a reliance on software with young children who need to manipulate their world in order to learn.

Young children are in the process of learning fundamental communication, sensimotor, social, and cognitive skills requiring a high level of direct in vivo engagement with the world around them. Computers are but one very limited source of input at this level. They are best utilized to teach higher level symbolic skills such as

mathematics, reading, and other abstract learning tasks that are facilitated by structured drill-and-practice routines (p. 76).

Semmel, Cosden, Semmel, & Keleman (1984) report the lack of research on the efficacy of various microcomputer applications with young children. Warren and Horn (1987) also emphasize that most of the instructional software used in early childhood special education was designed for non-disabled children. The degree to which these program can be an effective tool for disabled preschool and primary-age children has yet to be researched thoroughly. No literature addresses the use of these program with LEP disabled preschool and primary-age children.

Warren and Horn (1987) theorize that certain software program designed for the commercial market, particularly those using a game format, may be very useful for older (4- and 5-year olds) mildly handicapped children. "Younger and more severely handicapped children may benefit from cause/effect applications or from those in which the microcomputer 'assists' the teacher or therapists with direct instruction of some skills (p. 76)."

Despite the concerns of some educators, computer software can be effective in early childhood education. Characteristics of high quality early childhood software that could be used effectively in family literacy programs are based on the investigators' previous experience in the field as well as criteria developed by two independent evaluation groups: High/Scope Educational Research Foundation, using High/Scope Early Childhood Software Evaluation Instrument and Susan W. Haugland (Kids Interacting with Developmental Software Project, Southwest Missouri State University) and Daniel D. Shade (Computers as Partners Project, University of Delaware). These projects have determined that computer-based programs for this audience should be highly interactive, provide a sense of control over the learning, be open-ended, focus on real life situations and concrete materials, be variable in length, be effective in short periods of time, provide a variety of experiences, and be useable by more than one person at a time. Programs should also be easy to use, devoid of stereotypes, appeal to children's sense of silliness and playfulness, and give feedback that is easy to understand.

The computer also lends itself to a flexible family literacy program because it can provide speech and graphics as well as focus attention. Pieter

Reitsma in *Reading Research Quarterly* (1988) notes that activities using synthesized speech for computer-aided reading "appear to have clear motivational value and to increase the time children are willing to spend practicing important academic skills. Especially for children who are poorly equipped to acquire reading, extended involvement in reading is essential to further develop reading ability." The speech capabilities of the computer also facilitate students' sense of autonomy. Numerous educators have called for the creation of models for implementing and integrating microcomputer instruction into early childhood special education classrooms. (Warren & Horn, 1987; Brady & Hill, 1984; Cohen, 1983; Walker, 1983.)

Research into enhancing the language skills of LEP students strongly suggests that LEP, disabled children must first be competent in their native language before they are transitioned into English. Esquivel & Yoshida (1985) report that it may take 5 to 7 years for bilingual, non-disabled children to acquire enough competence in English to perform the academic and cognitive skills needed in school. Langdon (1983) argues that "the best time to acquire a second language (L2) may be when the first one is already well established (p. 38). Researchers (Langdon, 1983); Medina, Saldate, Mishra, 1985a & 1985b) stress that if a child with a low proficiency in the native language should not be simultaneously be instructed in English if the child is experiencing difficulties. Instead, first have the student gain proficiency in his/her native language. Research indicates that early instruction in the primary language reinforces skills in that language as well as facilitating greater proficiency in the second language. Genesse (1979) cogently captures the logic of this approach when she points out that the basic processes of reading are easily transferable once someone has learned to read in one language. Tinajero (1985) found that high levels of language proficiency in the native language were indicative of the cognitive maturity to manipulate language at the level that is required to perform academic tasks in English. Yet, despite the data that is available on the language approach that is most effective for bilingual, non-disabled students, bilingual special education lacks a "substantive body of empirical data on actual, well-controlled interventions with Hispanic pupils" (Figueroa, Fradd, & Correa, 1989, p. 177).

The fields of developmental literacy and language acquisition offer evocative insights into the impact of the family on children's emerging

literacy. Research data indicates family communications patterns greatly influence children's literacy development (Nickse, 1989). Parents are a child's first teacher. How parents interact with their children and the modeling they provide can have a life-long effect on a child's achievement and literacy competence. In addition, research provides important evidence that the educational level of the parents', and most notably the mother's, influences a child's achievement in school (Sticht, 1989). Research in child development also supports parental effects on achievement. In his 1988 study, Dickson notes research on the positive effects of parent involvement in a child's school, on the influence of child rearing practices, and on experiments in paired reading that indicate increases in children's achievement. Furthermore, Nickse (1989) cites research which suggests that adults are more likely to continue with literacy programs and the retention for both adults and children is greater when a literacy program addresses both audiences jointly.

When designing a program for at-risk pre-schoolers, it is important to understand the characteristics of this group. At-risk pre-school-age children's progress is greatly influenced by their family environment and their parents' involvement. Typically, these children suffer from lack of intellectual stimuli and poor parent expectations when it comes to educational achievement. In an attempt to address the first two problems, many preschool programs have tried to make parent education an integral part of the program (Goodson & Hess, 1976; Becher, 1984).

This data is echoed in the literature on LEP disabled children. Figueroa, Fradd, & Correa (1989) cite the positive role of culture and parent participation in "attenuating cultural conflict in the classroom (p. 174)." Meisels (1985) reports that students whose mothers were verbally supportive and responsive displayed greater problem-solving ability and were more successful in school than students with less interaction from their mother. "The evidence from a whole generation of research demonstrates that the quality of parents' behavior as caregivers and as teachers makes a difference in the development of infants and young children (p. 9)." Ruiz (1989) reporting on the highly successful OLE guidelines in California stresses the importance of effective parent interaction with this population. Warren & Warren-Rogers (1982) also call for improving the quality of parent interactions with their disabled, LEP/Bilingual children.

Hanson & Padden (1989) report on an interactive laserdisc program which enables students to work with interactive stories. Although created for older students, the program may have some application with handicapped, bilingual students in grades K-1. Other research into the use of technology with disabled students is evocative in its seeming application to bilingual, 4-7 year-old disabled students. However, no research has actually addressed this issue directly to help educators make wise decisions in the selection and application of technology with disabled LEP and non-English-speaking pre-school and early-childhood age children.

Technology, however, has enabled learning as well as provided access to education for special education and disabilities populations. Technology has become a powerful tool in the education of special needs populations. However, little research or literature has examined the use of technology with bilingual and LEP populations with disabilities. What little research and literature exist suggest that word processing programs that provide "literacy scaffolds" might help enhance education skills for older populations. The exact nature of this literacy support needs to be further explored, but speech, graphics, and writing process aids offer promise. Furthermore, the literature on bilingual and LEP populations indicates that interactive, multi-modal approaches also show promise. This literature stresses the need to place the learner in an active role, in charge of his or her learning. One of the strengths of computer-based technology is its ability to provide an active learning environment.

The literature is suggestive as to what technologies might best be adapted and employed for bilingual and LEP populations with disabilities. The challenge is to use this sparse literature base, coupled with the knowledge base developed from the research and literature on effective technology use with special education and disabilities populations in general, to test what technologies work best with bilingual and LEP populations with disabilities and what adaptations, if any, are needed to enable existing technology-based solutions to work with these populations.

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A P P E N D I X B

INTERVIEW PROTOCOL/OBSERVATION LOG

INTERVIEW PROTOCOL/OBSERVATION LOG
FOR INDIVIDUAL CASE STUDIES

This instrument is designed to document important information for use by the project staff in developing individual case studies for selected project participants. This form should be completed and updated by the teacher or other designated staff person on a periodic basis (e.g., every two or three weeks). If the participant receives instructional and related services from more than one person, then it should be completed by a designated person who will consult with other staff involved. When appropriate, any IEP meetings should be recorded or documentation of such meetings attached. Be sure to maintain confidentiality. The person completing this form is urged to maintain an audiotape on each participant to supplement comments, where appropriate. The individual completing this form and providing audiotaped, detailed comments should be prepared to send a copy of completed form and appropriate audiotapes approximately two months after the participant enters the program and every three months thereafter. Unless otherwise arranged, such information should be sent to:

Charles Blaschke, President, Education TURNKEY Systems, Inc.
256 North Washington Street, Falls Church, Virginia 22046.

1. Participant's name: _____
(or other identifier used by service provider)
2. Name of staff completing form: _____
Names of other staff consulted: _____
3. Date form completed/updated: _____
4. Learning Styles/Problems: Please describe learning styles/problems and the nature of disabilities; if described in IEP, please attached copy of relevant portions.

5. Use of CCP/ESL Center Program: Please describe any changes in the use of the CCP/ESL Center Program you made to accommodate the participant's needs and learning problems.

6. Use of Supplemental/Assistive Technology: Please describe what supplemental software materials and assistive technology has been used, how it was used, what learning problems it addressed, and any adaptations in the use of the software/technology you made.

a. _____

b. _____

c. _____

7. Learning Effects: Please describe any positive outcomes in the academic or functional language acquisition areas which have occurred and the degree to which you attribute them to the use of specific changes in the CCP/ESL program, use of supplemental software, and/or use of assistive technology. Please feel free to amplify on data reported in PPF and/or other data reported to U. S. BASICS. Please include any grades or results from teacher-generated tests.

8. Other Effects: Please describe other effects in the following areas:

a. Student Productivity:

b. Self-Concept and/or Self-Esteem:

c. Socialization and Relations with Peers and Others:

8. d. Motivation

9. Unanticipated Outcomes: Please describe the nature and extent of any unexpected outcomes/problems which can be attributed to the use of supplemental software and assistive technology; be sure to include any negative effects where appropriate.
10. Suggested Changes: Please describe any suggested changes in the CCP/ESL Center Program and/or the supplemental/assistive device(s) which you feel should be made; please focus on content, instructional design features, technical features, and teacher guides.

APPENDIX C

T.H.E. JOURNAL ARTICLE

At-Risk, ESL and Special Education: Many Products With Many Uses

by Elizabeth Greenfield

For those instructors, specialists, administrators and researchers who educate physically, emotionally or linguistically challenged students, the past years have seen a veritable blooming of computer-based support materials. Where there once was drought there is now a downpour of assistive hardware, software, literature, centers and more.

Many developers have realized that certain features are needed by a program or product to classify it as meeting the needs of special education, at-risk or ESL populations. Sometimes these features overlap. Instructors working in each of the above fields could easily find themselves fighting over the same program or device.

That is where the dilemma arises. Classifying a product as being just for ESL or special education is increasingly difficult. For example, a speech synthesizer/speaker is suited for blind students, those with poor reading skills and children who need to hear English spoken correctly. Many applications covered in this article may be only the tip of the iceberg for potential uses of that product. The challenge now is to take the myriad products available and see how any one's specific features can be useful in your situation.

■ What We're Doing

New to the market is The Conover Company's Integrator Series, which addresses basic skills needs for at-risk populations. Competency-based, it covers math, English, problem-solving and interpersonal skills. Each module has a diagnostic and a skill-enhancement component; deficiencies recognized in the



KIDWARE BY MOBIUS CORP. PHOTO BY ROSWELL NEIGHBOR

assessment portion are addressed by the skill-enhancement activities.

Simulations illustrate to students the relationships between academic skills and how they are applied in the work world. In addition, exercises are job-specific.

Pearl Washington is at the ESL Regional Vocational System in East St. Louis, Mo. She plans to utilize The Integrator in a program to improve approximately 200 at-risk students' basic skills in math, language arts, problem solving, critical thinking and more. Washington also plans to implement a second copy in an after-school program that will focus on including parents in instruction.

Wicat Systems, Inc. has recently announced the availability of six new programs for adult education. The titles are Functional Literacy, Functional Numeracy, Basic Literacy, Basic Numeracy, Life and Work Skills, and Adult Test of Basic Skills. The last package correlates to national tests such as TABE, ABLE and CASAS. Wicat also offers complete GED and testing curriculum.

In Valdosta, Ga., Ross Hudson has been using IBM Corp.'s Principle of the Alphabet Literacy System (PALS) with Digispeech Audio Adapter Units in two

networked labs. PALS is an interactive, multimedia instructional program that teaches at-risk and adult learners to write, read and touch-type.

At Valdosta Junior High, seventh and eighth graders are using the system in two labs that each house 12 to 14 IBM Model 25 computers. Students listen to PALS' voice, music and text components via headphones attached to the Digispeech units. A new lab will

open soon; about 250 students will use the three facilities during each 18-week semester.

In another instance, a relatively new product is being incorporated into adult basic education instruction in Pensacola, Fla. Southeastern Vocational Services (SVS) provides reading instruction for all members of the community, ages 16 to 60, who read at below ninth-grade levels.

SVS students use Bookwise, an interactive tutoring system from Xerox Imaging Systems that uses a scanner to input any reading materials then, via Intelligent Character Recognition, converts the ASCII-format text to computerized speech and reads it aloud. Comprised of scanner, software, co-processor card, interface cable and a DECtalk card with an external speaker, the system is used in Pensacola by 15 students each week.

Says Jeffrey Bowman, an adult basic education and literacy teacher at the Florida site: "Students using Bookwise score higher on comprehension questions. Reading disabled people have had to depend on others to help them. With Bookwise, they need little or no assistance."

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Trends (continued)

This system and those like it are similarly applicable in learning disabled applications, such as for those who are dyslexic. Also, students who have either limited hearing or sight can benefit, as well as those in ESL programs. In all instances English is spoken out loud and the text highlighted on screen so users can follow along.

■ ESL Help

Several programs are available to help English as a Second Language (ESL) instructors. These programs usually offer a whole-language approach to instilling English reading, writing, speaking and listening skills. As might be imagined, audio components are quite important in these programs. While the majority of ESL software target native Spanish-speaking students, there are a few designed to instruct Japanese students as well.

A multimedia, CD-ROM-based ESL system, English Express from Davidson & Associates has recently been adopted by the Utah State Textbook Commission for ESL instruction. The disc, along with Longman picture books, cassettes and teacher support materials, supplies students with 1,400 digitized photos and several audio language models.

Using journals and speech input and playback, English Express will give Utah's 40,000-plus bilingual population tools to improve their English skills. In the Sweetwater Union School District, for example, 19 secondary schools and four adult education sites have adopted it.

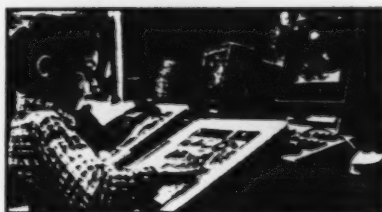
ESL Exceller from Exceller Software Corp. offers reading, writing, speaking and listening exercises for students in grades 3 to 8. IBM PS/2-compatible, the program develops vocabulary in a multiple-choice format; grammar exercises tackle some of English's more confusing principles. ESL Exceller also reinforces reading skills by stressing the main idea, understanding details and drawing conclusions.

Another product, FirstAid English from Animated Voice Corp., helps entry-level to intermediate students learn English. Icon-based, its categories include emergency situations, health, beauty, housing, inquiry, arguing and saying no, covering 47 realistic situations. Students can view an animated

dialog sentence by sentence, act out any role in the dialog then replay their voices to hear themselves, and test their overall comprehension.

The same company is also introducing a CD-ROM titled AniVox Eiken, a multimedia system for Japanese school children studying English.

And lastly, Applied Voice Technologies has introduced their product, SPEAK NOW. This complete ESL package stresses visualization, audio feedback, vocal repetition with the ability to record students' speech, word-sound comparison and knowledge reinforcement or exams.



SCAN & HEAR WITH BOOKWISE

Two DOS versions are offered: one covers over 1,200 words and phrases and includes a sound card, integrated microphone/earphone headset and optional speakers; the second sports 21 lesson diskettes for a total of 6,000 words/phrases.

The Mac version boasts 21 lessons and an added SNAP module, which allows instructors to author their own lessons or modify the existing 21. Version 1.1 of SPEAK NOW for the Mac will include QuickTime movies.

■ More Examples

Terri Heidger, the Chapter I reading specialist at Abraham Lincoln Elementary in Levittown, Pa., has been implementing the Accelerated Reader program from Advantage Learning Systems, Inc. for two and a half years. This combination literature/computerized exam system is highly motivational, exercising a point-and-reward system for those students who read selected books and pass accompanying computer-based tests. About 1,400 books, ranging from *Eddie and the Fire Engine* to *Anna Karenina*, are involved.

The 89 Chapter I students Heidger works with range from second to sixth graders. She and the students read together or independently, using activities she creates to assist them. After completing the book, students move to the computer. "For many this is the first successful event they've had with reading," says Heidger. "Every week I post

scores. The top 10 students are given prizes."

She also details how Accelerated Reader not only boosts the Chapter I kids' self esteem, it takes away the stigma of being associated with a non-traditional class. Heidger tells of how children in the standard classes have wanted to "be in Chapter I" so they could earn points and win prizes.

Skills Bank II is another at-risk program that evaluates each student then prescribes specific areas for study, testing and review. It focuses on reading, math, language, writing and study skills.

Using Skills Bank II since fall of 1991, Allen Morris is the at-risk coordinator for both Ennis Junior High and Ennis High School in Ennis, Texas. These children, up to 150 throughout the year, are separated from normal classes due to discipline, attendance or some other problem. Put in a controlled environment, they must complete their normal assignments, plus make use of Skills Bank II's activities. They are on a rotational schedule; some are in the at-risk atmosphere for 10 days, others until the end of the semester.

"The program is open-ended enough to hone in on a particular area. I can assign particular lessons rather than [being tied into] what the system chooses," Morris explains.

■ Special Needs

Special education products continue to flourish. Captain's Log Cognitive Training System from BrainTrain is targeted to those afflicted with brain injuries, yet is also helpful for learning disabled students with attention or cognitive deficiencies. It is an evaluation and treatment system to assess and remediate cognitive/perceptual motor deficits.

Four training disks—Attention Skills, Visual/Motor Skills, Conceptual Skills and Numeric Concepts/Memory Skills—offer a total of 28 programs; each is menu-driven. Exercises include finger tapping, mazes, spatial orientation, three kinds of visual tracking, and auditory and color discrimination.

Accessible via single-switch, a paddle or a keyboard, LogoWriter for Special Needs from Logo Computer Systems, Inc. helps physically disabled students create graphics and simple text. With a graphics library and text-processing tool, the program lets students stamp shapes and draw images. Ten activities offer eight graphic themes; text options print in big letters to assist visually im-

(continued on page 10)

Trends (continued)

paired students.

Since many commercial software programs could be used with disabled students yet do not accept non-traditional input devices, Don Johnston Developmental Equipment has compiled AFC: Literacy Setups, a collection of 130 ready-to-use setups that allow software to accept Adaptive Firmware Card (AFC) input.

Designed for Apple IIe and Apple IIgs early-literacy programs, the setups run with McGee, Katie's Farm, Create with Garfield, Muppet Slate, The Playroom and 15 others. Input methods such as scanning, Morse code, assisted keyboard, expanded keyboard and AFC Access: TouchWindow are supported.

IBM Corp. offers a multitude of products for special education through its new company, EduQuest. In the EduQuest 1992 software catalog for pre-kindergarten through adult students, seven products are specifically noted: SpeechViewer and SpeechViewer II, Screen Reader, VoiceType, PhoneCommunicator, THINKable and AccessDOS.

In addition, IBM extends assistance to disabled students and their teachers through a referral center. For more information about the center, write to: IBM Special Needs Information Referral Center, P.O. Box 2150, Atlanta, GA 30301-2150.

■ Products in Action

Deaf instructors usually agree that there is a serious lack of closed-captioned materials suitable for instruction. Now there is a system that instructors can use to caption a pre-recorded videotape—CPC-500 CaptionMaker from Computer Prompting Corp.

The DOS-compatible software is used with a Line 21 Encoder or Line 21 Video Decoder and two VCRs. Instructors can use CPC-500's built-in word processor to develop a script, or import one from another word processor. While viewing the tape, the instructor sends corresponding caption lines to the computer.

Jean Moog, the principal at Central Institute for the Deaf in St. Louis, Mo., has just begun using the system. The school has had three pre-recorded tapes closed captioned, however plans are to involve four to five instructors in a program that will teach them to create and

caption their own videotapes.

"As soon as possible we would like to start filming students to develop experience-reading exercises. We have been taking Polaroids [of students in an activity], then writing sentences about them."

Margaret Sauvain, a special education instructor at Contoocook Valley Regional High School in New Hampshire, is using Dr. Peet's Talk/Writer from Hartley Courseware, Inc. When students type a letter or word, the program reads it aloud. One disk explores the alphabet while the second is a simplified word processor. An Echo speech synthesizer is needed to read the text.

Sauvain tells of one 19-year-old student with autism who was non-verbal. After using Dr. Peet's for two hours each day, over the course of several months the girl could type from her reading program or from cards provided by the instructor. Says Sauvain: "For the first time, she could let us know how intelligent she really is."

Also working with handicapped and non-speakers, Vicki Nelson at the Litzinger School in Missouri has been using MECC software and Don Johnson AFC: Literacy Setups. She teaches seven children aged six to ten who function at kindergarten and first-grade levels. Independently or in teacher-led groups, students interact with programs such as Clock Works, Fun From A to Z and

Counting Critters.

Nelson comments that her class really enjoys working with software. For them, working independently on the computer is just about the only activity they can do by themselves.

■ To Conclude

In conclusion, given the right tools, many resources that may have once been considered appropriate only for special education or only for ESL are now suited for both and more.

Plus teacher-support software has become more mature. Packages such as Learning Disabilities: What to Do After Diagnosis from Apodixis, Inc.; WISC-R Compilation: What to Do Now That You Know the Score from Academic Therapy Publications; and Dyslexia Analysis from Education Analysis help educators determine the extent of a student's deficiency and which steps to take next.

Basically, a product's features and functions should be carefully studied, yet the "intended" applications taken only as a starting point. Educators working with students who need extra support and nurturing realize that each student is different. It is that instructor's mission to find as many materials as possible to help special students reach their full potential. ■

(see directory on page 12)

Literature

1990 Annual Report to Congress on the Education of the Handicapped Act. Conducted by Education Turnkey Systems, Inc., this report strongly suggests that "moderate to significant benefits can be achieved by LEP [Limited English Proficient] populations...through the use of new assistive technologies and software." The benefits of a particular technology product or program that assists specific types of individuals are identified. *

I Make a Difference! A Curriculum Guide Building Self Esteem and Sensitivity in the Inclusive Classroom. Written by Michele C. Tamaren and supplied by Academic Therapy Publications, this guide helps teachers make their standard classes non-threatening to mainstreamed disabled students through multi-sensory, cross-curriculum activities targeted to students in grades 4 to 8.

IBM Educational Courseware: Integrating the Needs of Students in Special Education. Available from IBM Corp. at no charge, this guide matches educational courseware to the needs of students. Instructional methods, content level, presentation, input, feedback to user response and an overall assessment of the courseware are also included.

Learning About Learning Disabilities. This 22-minute VHS videotape and accompanying manual from Therapy Skill Builders provide information on the sensory problems common to learning disabled students. Scenes include elementary and high school students with learning disabilities responding to their peers and teachers. It is suited for inservice training for special educators and occupational therapists, teachers and parents.

Trends Directory

Academic Therapy Publications
Novato, CA
Write No. 901 on Inquiry Card

Advantage Learning Systems, Inc.
Port Edwards, WI
Write No. 902 on Inquiry Card

Animated Voice Corp.
San Marcos, CA
Write No. 903 on Inquiry Card

Apodixis, Inc.
Dallas, TX
Write No. 904 on Inquiry Card

Applied Voice Technologies
Fullerton, CA
Write No. 905 on Inquiry Card

Braintrain
Richmond, VA
Write No. 906 on Inquiry Card

Computer Prompting Corp.
Washington, DC
Write No. 908 on Inquiry Card

The Conover Co.
Omro, WI
Write No. 938 on Inquiry Card

Davidson & Associates
Torrance, CA
Write No. 909 on Inquiry Card

Digispeech, Inc.
Placerville, CA
Write No. 910 on Inquiry Card

Don Johnston Developmental
Equipment
Wauconda, IL
Write No. 911 on Inquiry Card

Edmark Corp.
Bellevue, WA
Write No. 912 on Inquiry Card

Education Analysis
Round Rock, TX
Write No. 913 on Inquiry Card

Education Turnkey Systems, Inc.
Falls Church, VA
Write No. 914 on Inquiry Card

Educational Resources
Elgin, IL
Write No. 915 on Inquiry Card

EduQuest (an IBM Co.)
Atlanta, GA
Write No. 916 on Inquiry Card

Exceller Software Corp.
Ithaca, NY
Write No. 917 on Inquiry Card

Foundation for Technology Access
Albany, CA
Write No. 918 on Inquiry Card

Hartley Courseware, Inc.
Dimondale, MI
Write No. 919 on Inquiry Card

IBM Corp.
Milford, CT
Write No. 920 on Inquiry Card

Intellimation
Santa Barbara, CA
Write No. 921 on Inquiry Card

Interactive Learning Materials
Katonah, NY
Write No. 922 on Inquiry Card

J.E. Stewart
Seattle, WA
Write No. 923 on Inquiry Card

Laureate Learning Systems, Inc.
Winooski, VT
Write No. 924 on Inquiry Card

Logo Computer Systems, Inc.
Montreal, Quebec, Canada
Write No. 925 on Inquiry Card

MECC
Minneapolis, MN
Write No. 926 on Inquiry Card

Mindplay
Tucson, AZ
Write No. 927 on Inquiry Card

Mobius Corp.
Alexandria, VA
Write No. 928 on Inquiry Card

National Lekotek Center
Evanston, IL
Write No. 929 on Inquiry Card

Quality Computers
St. Clair Shores, MI
Write No. 930 on Inquiry Card

Quest International
Granville, OH
Write No. 931 on Inquiry Card

R.J. Cooper & Associates
Dana Point, CA
Write No. 932 on Inquiry Card

Skills Bank
Baltimore, MD
Write No. 933 on Inquiry Card

Teacher Support Software
Gainesville, FL
Write No. 934 on Inquiry Card

The Conover Company
Omro, WI
Write No. 935 on Inquiry Card

Therapy Skill Builders
Tucson, AZ
Write No. 907 on Inquiry Card

Xerox Imaging Systems
Peabody, MA
Write No. 936 on Inquiry Card

Wicat Systems
Orem, UT
Write No. 937 on Inquiry Card

This list of vendors of relevant products
and/or services is offered as further reference
for readers and is not meant to be
comprehensive.

Learn AutoCAD from an experienced teacher— New Riders Publishing!



AutoCAD Instructor's Guide
Here is the complete
supplemental guide for
teaching from the AutoCAD
Student Workbook! Includes
student exercises and
transparency masters.
1-56205-024-9, \$175.00 USA



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training! Includes a disk with
practice exercises and
examples to prepare students
for the AutoCAD Certified
Operators Exam.
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APPENDIX D

STUDENT'S PROBLEMS/RESULTS

Learning Problems of Project Participants by Results

Site 1	Learning Problem	Areas of Marked Improvement
Student 1	Slurred speech Phrasing problems Can't attend to tasks Comprehension problems Low literal reading skills Has trouble with pencil/paper tasks Needs prodding to proceed to next task	Reading increased from second to fourth grade level Now willing to make speeches in other classes Increased productivity—now can complete pencil/paper tasks along with computer activities; and does paperwork more completely and correctly Accepts peer tutoring assignments More open communication Improved interrelationships Now more of a self-starter; more confident Will be ready for mainstreaming by year's end Paperwork tasks completed more accurately with computer work as reward Progressed from first to third grade reading level on the TABE Has begun to write short paragraphs
	Technology Solutions	Related Results
	Speech Viewer IBM/Apple Software CCP/ESL: Audio cassettes	Student now reads orally after computer work Targets specific speech problem areas Slows down speech Helps speech become clearer, more recognizable Develops word recognition skills Helps correct phrasing
Site 1	Learning Problem	Areas of Marked Improvement
Student 2	Low English comprehension skills Auditory discrimination problems Information retention difficulties Short attention span	Speaks more English in class, participates more Improved self-confidence, self-identity Productivity increased, especially in computer tasks Increases noted in other subjects Becoming more independent More willing to question, to try difficult tasks Beginning to help others—improved socialization More motivated as a self-starter, risk taker Improved appearance Reading level increased from second to fourth grade level Works more neatly Completes more seat work independently Refuses to turn in incorrect work Quality of work has improved Joins in on more group activities TABE scores improved from 1.2 to 2.5
	Technology Solutions	Related Results
	Speech Viewer CCP/ESL Program	Corrects speech patterns and phonic problems Develops phrasing

Learning Problems of Project Participants by Results

Site 1	Learning Problem	Areas of Marked Improvement
Student 3	Cannot read or speak any language Can't retain information Easily distracted Low self-confidence Needs constant direction	Will now speak along with the voice-activated software, but won't on own in class Acquired basic letter and number recognition Slowly increasing amount of work done Beginning to have some self-esteem Has started to join working groups voluntarily Takes increased responsibility Makes more independent decisions Has spoken a first complete English sentence Strives to speak correct English TABE scores improved from 1.7 to 3.1
	Technology Solutions	Related Results
	Touch Window Speech Viewer	Reinforces, provides feedback constantly Has opened up a whole area of communication previously untapped
Site 1	Learning Problem	Areas of Marked Improvement
Student 4	Can't read any language Has trouble completing tasks High frustration level Some disruptive behavior Very low motivation Ignores others Only speaks a little English	Completes work more independently Is less disruptive; less defensive More productive in completing assignments Feels proud of computer work More open with others; has started to talk a lot Increased motivation: now races to class Beginning to develop an independent identity Started peer tutoring—took initiative to help another Smiles more often; more positive interaction Has shown improvement in other classes Less afraid of peer reactions Chip on shoulder has disappeared
	Technology Solutions	Related Results
	IBM software Speech Viewer	Spelling and vocabulary games boost motivation Increases pronunciation skills by requiring speech
Site 1	Learning Problem	Areas of Marked Improvement
Student 5	Cannot read Spanish Does not speak or read English Has difficulty using words, phrases Easily distracted Has difficulty staying on task Retention problems Limited conceptual understanding Late to class constantly Defers to brother in class	Started talking to the computer, then to other students more freely with the intention of learning Interactive programming made communication easier Fear decreased, self-confidence increased Now early to class; completes work on time Enjoys work and stays on task; takes pride in work Initiates more responses alone Takes more pride in work Penmanship has improved Has become competitive with peers Much improved language skills
	Technology Solutions	Related Results
	Speech Viewer Micro Lads Touch Window	Corrects pronunciation problems Increases skill in recognizing words and phrases Develops ability to recognize sentences

Learning Problems of Project Participants by Results

Site 2	Learning Problem	Areas of Marked Improvement
Student 1	Deficient rate of learning	Improved functional English skills Improved social interaction using English outside class
	Technology Solutions	Related Results
	Microlads Optimum Resource Reading Program CCP ESL materials	Gains in language proficiency Provides variety, sustains interest Test scores rose from 68 to 82%
Site 2	Learning Problem	Areas of Marked Improvement
Student 2	Verbal and math skills much below grade level Immature for age Attention deficits Trouble relating to others Has lisp and other speech problems Unresolved psychological problems Deficient social skills Has trouble with English pronunciation	Some English decoding skill
	Technology Solutions	Related Results
	Microlads CCP ESL materials—magnetic tape cards	Functional vocabulary increased Pronunciation improved Test scores jumped from 24 to 40 %
Site 2	Learning Problem	Areas of Marked Improvement
Student 3	Academic skills way below grade level	Functional English skills greatly improved English reading skills improved Enjoys increased facility with language; participates
	Technology Solutions	Related Results
	Optimum Resource Reading Program Microlads CCP ESL materials	Pronunciation improved English acquisition accelerated Decoding skills enhanced Functional language skills increased CCP test scores went from 50 to 60%
Site 2	Learning Problem	Areas of Marked Improvement
Student 4	Slow learner in eighth grade	Has made sufficient improvement to be mainstreamed Increased English skills
	Technology Solutions	Related Results
	Franklin Dictionary Optimum Resource Reading Program CCP ESL materials	Dictionary helps with learning vocabulary Needs monitoring, but works alone Improved reading ability Test scores improved from 54 to 66%

Learning Problems of Project Participants by Results

Site 2	Learning Problem	Areas of Marked Improvement
Student 5	Borderline slow learner with specific problems in math and reading comprehension	Modeling and practice has greatly improved her English skills Needs monitoring, but works alone Takes extra work home in English
	Technology Solutions	Related Results
	Microlads Optimum Resource Reading Program CCP ESL materials	Increased motivation to use language in and outside of classroom Improved functional English skills Test scores improved from 60 to 78%
Site 2	Learning Problem	Areas of Marked Improvement
Student 6	Specific problems in abstract reasoning	Greatly improved functional reading skills Now more talkative
	Technology Solutions	Related Results
	Microlads Optimum Resource Reading Program CCP ESL materials—magnetic tape cards	Improved self-concept Enjoys speaking more Increased language skills Test scores increased from 47 to 60 %
Site 3	Learning Problem	Areas of Marked Improvement
Student 1	No previous education Difficulty retaining materials Needs constant repetition Cannot remember sight words Difficulty isolating words	Can copy letters Improved listening, writing, and reading skills Increased productivity Student serves as peer tutor More of an active learner Quick to correct own mistakes
	Technology Solutions	Related Results
	Speech Viewer English Express with Speech Master Microlads STAR Program Eye Relief CCP ESL materials Conover Signs	Can accurately replicate vowel sounds Accurately writes what appears on the screen Improved sound/symbol relationships Better retention of word meaning Visual and short-term memory improved Enlarged print assisted comprehension Mastered simple grammar concepts; decoded words with language cards Learning safety signs and how to independently run the program

Learning Problems of Project Participants by Results		
Site 3	Learning Problem	Areas of Marked Improvement
Student 2	Low reading and writing skill levels Reverses letters and leaves off endings of words Inconsistent when writing the same words at different times	Oral proficiency improved
	Technology Solutions	Related Results
	Speech Viewer	More readily grasps the precise pronunciation of English phonemes
Site 3	Learning Problem	Areas of Marked Improvement
Student 3	Language communication problems Articulation errors	Much more easily understood now Actively monitoring speech Utterances more complex Increased productivity Heightened self-image Increased confidence English is dramatically improved
	Technology Solutions	Related Results
	Speech Viewer English Express Eye Relief	Pitch, intonation, and loudness improvement Attempts to correct own errors. Now uses correct vowels, makes attempt to pronounce consonants in final position of words Great pronunciation improvement, especially accent and fluency Is more confident with keyboard. Brings in word lists to practice on her own
Site 3	Learning Problem	Areas of Marked Improvement
Student 4	Communication problems when in out-of-school settings Reading problems Short attention span Transposes letters when reading aloud Does not produce final consonants Has difficulty with fricatives Many articulation errors	Pronunciation of vowels has improved tremendously Increased productivity Becoming more confident
	Technology Solutions	Related Results
	Speech Viewer Microlads	Better reproduction of vowel sounds in English Better speech monitoring of pitch and intonation Acquired simple grammar concepts by using the program without sound

Learning Problems of Project Participants by Results		
Site 3	Learning Problem	Areas of Marked Improvement
Student 5	Difficulty decoding words; often transposes letters	Increased productivity Is reading after one year of learning the alphabet Considerable improvement in reading and writing skills Transposes letters less
	Technology Solutions	Related Results
	Speech Viewer English Express with Speech Master/ Language Builder STAR Program	Improved sound/symbol association Improved listening, spelling, vocabulary, and writing skills Increased use of writing Looks up words in the dictionary Motivated by record keeping
Site 3	Learning Problem	Areas of Marked Improvement
Student 6	Short attention span Gets up in class at inappropriate times	Improved time on task More self-disciplined
	Technology Solutions	Related Results
	English Express with Speech Master STAR	Helped student respond to simultaneous stimuli Increased vocabulary
Site 3	Learning Problem	Areas of Marked Improvement
Student 7	Low auditory comprehension Short attention span Difficult to focus on any printed material	Auditory comprehension is increasing Concentration is improving
	Technology Solutions	Related Results
	English Express with Speech Master English Express with Language Builder Eye Relief	Helped student respond to simultaneous stimuli Practiced and improved spelling Keyboard proficiency improved along with ability to name letters and pronounce sounds
Site 3	Learning Problem	Areas of Marked Improvement
Student 8	Pronunciation problems Leaves off ends of words Unable to pay attention Overly dependent on teacher Difficulty moving from one task to another Has trouble understanding vowels	Between letter differentiation now Pronunciation more accurate Now self-monitors speech Self-concept improving Increased communication overall Greatly improved keyboarding skills
	Technology Solutions	Related Results
	Speech Viewer Eye Relief English Express: Language Builder Speech Master STAR	Helped vowel pronunciation Greatly improved vocabulary Particularly successful with spelling Produced initial benefits in improving motivation Helped in early months of project on vocabulary development

Learning Problems of Project Participants by Results		
Site 3	Learning Problem	Areas of Marked Improvement
Student 9	Speech impediment Has trouble transferring knowledge from one context to another	Pronunciation has become easier; clearer Productivity steadily increasing Improved self-concept
	Technology Solutions	Related Results
	Speech Master English Express Microlads STAR Eye Relief	Improved spoken grammar and use of personal pronouns More confidence in using vocabulary Has learned to spell many words Improved ability to identify grammatical patterns Able to complete listening/word identification exercises Strengthened ability to remember routines for using software and for working with visual information
Site 3	Learning Problem	Areas of Marked Improvement
Student 10	Leaves off word endings Reverses letters Short attention span Has trouble accurately associating sounds and symbols	Improved productivity Confidence increasing
	Technology Solutions	Related Results
	English Express with Speech Master/ Language Builder STAR	Now able to self-correct Can hear, sound out, and accurately write words Improved sound/symbol association
Site 3	Learning Problem	Areas of Marked Improvement
Student 11	Only had three years of education Reading and writing difficulties Reverses letters, leaves off beginning of words, adds extra letters	Increased productivity Improved self-esteem
	Technology Solutions	Related Results
	Speech Viewer English Express with Speech Master/ Language Builder STAR	Improved vowel identification Increased sound/symbol association Well into program even with severely limited vocabulary
Site 3	Learning Problem	Areas of Marked Improvement
Student 12	Student exhibits very distracting behaviors Short attention span Difficulty with concentration Reading and writing tasks prove difficult	Increased interest and productivity Increased confidence in performance
	Technology Solutions	Related Results
	Speech Viewer English Express with Speech Master	Improved sound/symbol association

Learning Problems of Project Participants by Results		
Site 4	Learning Problem	Areas of Marked Improvement
Student 1	First grade reading level Works slowly Often does not understand Often uses wrong verb Doesn't understand concepts of more or less Confuses d and b when reading Weak grammar skills	Now can compose simple sentences Increased self-initiative—listens to tapes on her own Completes work faster
	Technology Solutions	Related Results
	English Express STAR	Increased conceptual understanding Increases vocabulary
Site 4	Learning Problem	Areas of Marked Improvement
Student 2	Withdrawn Reluctant to verbalize	Increased pride in work Exhibits less resistance
	Technology Solutions	Related Results
	STAR Speech Viewer English Express CCP ESL materials	Increased vocabulary Increased volume of speech Reinforces new skills Some ability to read at primary level
Site 4	Learning Problem	Areas of Marked Improvement
Student 3	Difficulties with expressive and receptive speech Poor long and short term memory Poor visual/motor integration	Increased attention span Improved eye-hand coordination
	Technology Solutions	Related Results
	Lexia CCP ESL materials	Helps break down decoding skills, reading facilitated Supplemental activities reinforced learning
Site 4	Learning Problem	Areas of Marked Improvement
Student 4	Poor concentration skills Some apparent emotional problems Slurs sounds together Can't decode words Short attention span	Improved self-confidence Cooperates with peers Attends to tasks 80% of time Completes own work, now asks if he can help others with theirs
	Technology Solutions	Related Results
	Speech Viewer Lexia CCP ESL materials English Express	Says more sounds correctly Helps break down decoding skills, reading facilitated Supplemental activities reinforced learning Reinforced learned skills

	Learning Problems of Project Participants by Results	
Site 4	Learning Problem	Areas of Marked Improvement
Student 5	Medical problems Limited vocabulary and expression	Increased time on task More cooperative with peers
	Technology Solutions	Related Results
	Lexia Speech Master CCP ESL materials Eye Relief	Increased decoding skills Improved vocabulary Learned skills reinforced Has begun writing own stories

APPENDIX E

PRODUCTS/SKILLS

Reasons Assistive Technology Contributed to Learning

Product	Benefit	Number of Times Mentioned
1. Speech Viewer	1. a. pronunciation—	
	• targets specific individual problems	1
	• develops articulation skills	
	• practices accuracy and volume control	1
	1. b. speaking—	
	• allows interactive correction for improvement	1
2. Touch Window	• reinforces sound/symbol identification and production	1
	1. c. writing—	
	• enables students to visualize phrasing of English	1
	2. a. reading—	
	• helps with recognition of sentence structure	1
	• assists in interpreting directions, maps, schedules	1
3. Microlads	• develops sentence structure and vocabulary skills	1
	2. b. listening—	
	• corrects errors; shows improvement areas	1
	• develops ability to listen for understanding	1
	• allows students to hear correct pronunciation and phrasing	1
	2. c. grammar—	
4. Eye Relief	• develops sentences targeting nouns	
	• shows phrasing with distinction between subject and predicate	
	3. a. reading—	
	• helps with recognition of sentence structure	1
	3. b. grammar—	
	• teaches and explains parts of speech	2
	• develops business letter writing skills	1
	• explains concepts of grammar to help speech development	1
	• uses verbs/plurals and other grammar skills	1
	3. c. listening—	
	• corrects errors, pinpoints improvement areas	1
	3. d. pronunciation—	
	• improves speech deficits	1
	4. a. writing—	
	• allows students to see English phrasing	2
	• affords easy word processing for stories and papers	1

Reasons Assistive Technology Contributed to Learning

Product	Benefit	Number of Times Mentioned
5. English Express	5. a. pronunciation—	
	• improves skills by requiring audio-oral work	1
	• deals with consumer and survival topics useful outside of the classroom in the world of work	
	5. b. reading—	
	• develops vocabulary skills and sentence structure	
	5. c. listening—	
	• allows students to hear correct pronunciation and phrasing	2
	• voice-activated to allow comparing speech to words heard	1
	5. d. speaking—	
	• allows speech with correct feedback	
	5. e. writing—	
	• serves as a springboard to help students write what is heard	
	5. f. grammar—	
	• pictorial, verbal format interests students	2
6. Talk to Me	6. a. pronunciation—	
	• corrects sentence phrasing	1
	6. b. reading—	
	• develops sentence structure	
	6. c. listening—	
	• allows students to hear correct pronunciation and phrasing	
	6. d. speaking—	
	• allows speech with correct feedback	1
	• helps clarify speech flaws and volume of sound	1
	6. e. grammar—	
	• uses simple sentence structures to promote phrasing	1
7. Q Solution	7. a. reading—	
	• develops word recognition skills	1
	7. b. listening—	
	• allows correct pronunciation to be heard	1
	• includes community-oriented terms to promote independence	1
	7. c. writing—	
	• encourages the creation and inscribing of stories	
8. Optimum Reading Resource Program	8. a. pronunciation—	
	• emphasizes the phonetic process	1
9. Lexia	9. a. reading—	
	• helps with decoding skills	1
	9. b. listening—	
	• requires listening to directions	
10. STAR	10. a. reading—	
	• increases vocabulary	

APPENDIX F

REVISED ESL PLAN/PROFILE FORM

Revised ESL Plan and Profile Form

Level 1. Basic Skills Unit 1 - Basic Letter Recognition Lesson 1 - Writing Alphabet Lesson 2 - Reading Readiness, Reading Alphabet Lesson 3 - Letter and Word Recognition Lesson 4 - Sounds and Written Symbols Lesson 5 - Alphabet Review Lesson 6 - Alphabet Review Unit 2 - Basic Sound Recognition Lesson 1 - Review Beginning Sounds Lesson 2 - Distinguishing Letter Sounds Lesson 3 - Distinguishing End-Middle Sounds Lesson 4 - Digraphs Lesson 5 - Initial and End Sounds Unit 3 - Numbers Lesson 1 - Writing Numbers Lesson 2 - Recognizing Numbers Lesson 3 - Counting Numbers (0-9) Lesson 4 - Counting Numbers (10-20) Unit 4 - Family and Well-Being Lesson 1 - Family Relations 1 Lesson 2 - Family Relations 2 Lesson 3 - Personal Information Lesson 4 - Telephone Communication Lesson 5 - States of Being and Feeling Unit 5 - Time Lesson 1 - Telling Time Lesson 2 - Time of Day Lesson 3 - Punctuality Lesson 4 - Days of the Week Lesson 5 - Calendar Lesson 6 - Weather	Unit 2 - Maps, Route, and Signs Lesson 1 - Directional Concepts Lesson 2 - Signs and Symbols Lesson 3 - Measurements Lesson 4 - Maps Lesson 5 - Directions Lesson 6 - Bus Schedules Lesson 7 - Review of Signs and Symbols
Level 2. Unit 1 - Money and Banking Lesson 1 - Names and Values of Coins Lesson 2 - Written Symbols for Money Value Lesson 3 - Identifying Cost of Things Lesson 4 - Money and Change Lesson 5 - U.S. Money Lesson 6 - Review of Money Concepts Unit 2 - Foods—Various Settings Lesson 1 - Food Recognition Lesson 2 - Shopping for Food Lesson 3 - Types of Food Stores Lesson 4 - Reading a Menu Lesson 5 - Eating at a Restaurant Unit 3 - Housing—Rooms and Furnishings Lesson 1 - Rooms and Furnishings 1 Lesson 2 - Rooms and Furnishings 2 Lesson 3 - Locating Housing 1 Lesson 4 - Locating Housing 2 Lesson 5 - Rental Regulations Unit 4 - Plants and Animals Lesson 1 - Animals Lesson 2 - Plants	Level 4. Unit 1 - Shopping Lesson 1 - Clothing 1 Lesson 2 - Clothing 2 Lesson 3 - Fabrics 1 Lesson 4 - Fabrics 2 Lesson 5 - Comparative Shopping Lesson 6 - Purchasing Procedure Unit 2 - Parts of Body and Medicine Lesson 1 - Parts of Body 1 Lesson 2 - Parts of Body 2 Lesson 3 - Reading Medicine Labels Lesson 4 - Shopping for Medicine Lesson 5 - Measurements Lesson 6 - Prescriptions and Medical Doses Lesson 7 - Prescription Drugs Unit 3 - Medical Help and Appointments Lesson 1 - Medical Problems Lesson 2 - Medical Help Lesson 3 - Medical Appointments Lesson 4 - Dental Appointments Lesson 5 - Medical Emergencies Lesson 6 - Emergency Words
Level 3. Unit 1 - Transportation Lesson 1 - Using a Bus, Plane, or Train Lesson 2 - Local Transportation Lesson 3 - Using a Car	Level 5. Unit 1 - Recreation Lesson 1 - Sports Lesson 2 - Parks (local) Lesson 3 - Parks (national/international) Unit 2 - Community Lesson 1 - Places of Aid in Communities Lesson 2 - Government Agencies Lesson 3 - Medical Help Lesson 4 - Educational Help
Level 6. Unit 1 - Forms Lesson 1 - Giving Information Lesson 2 - Filling Out Forms 1 Lesson 3 - Filling Out Forms 2 Lesson 4 - Filling Out Forms 3 Lesson 5 - Filling Out Forms 4 Unit 2 - Occupational—Getting a Job Lesson 1 - Interviews 1 Lesson 2 - Interviews 2 Lesson 3 - Names of Jobs Lesson 4 - Work Times Lesson 5 - Job Tools Unit 3 - Finding a Job Lesson 1 - Using Directions Lesson 2 - Parts of a Newspaper Lesson 3 - Preparing for a Job Lesson 4 - Locations of Jobs Lesson 5 - Making an Appointment	

APPENDIX G

CASE STUDY REPORTS

This appendix contains case study summary reports for 19 project participants who were observed in depth.

PARTICIPANT ID: H-001

October 10, 1991 - June 30, 1992

This student tested in September at 91 percent using the ESL test, placing the student in the Basic Skills Tier 1.2 of the CCP Program. In January, the student tested on the TABE E and showed a gain to approximately a 3.0 reading level. Although the instructor reported a gain in the TABE reading score at the end of the year, no quantitative score was provided. The student was reported to be more self-disciplined and more self-confident at the end of the study. In addition, the student now competes with peers, indicating that the student's self-confidence has grown. The student takes much more pride in completed work than at the outset of the study.

1. LEARNING STYLES/PROBLEM:

The student slurred speech and had a problem with phrasing, producing words that were difficult to understand at times. The student has difficulty concentrating and, thus, found it very difficult to stay on task. Reading comprehension and lateral reading skills were poor, despite many repetitions of material and the use of a variety of approaches.

2. USE OF CCP/ESL CENTER:

The computer programs were used as reinforcement and reward because the student had difficulty concentrating for the time necessary to complete paper-and-pencil tasks. The result was that the student's paper-and-pencil tasks were more complete and correct when the computer was provided as an incentive.

3. USE OF SUPPLEMENTAL ASSISTIVE TECHNOLOGY:

a. *IBM SpeechViewer*: This program provided sound practice in slowing down the learner's rate of speech to a more easily understood level and in improving enunciation. Although speech problems did not impede academic progress in a measurable way, improving speech enhanced the student's self-esteem. The student's speech is now clearer and more understandable. The student is also more willing to speak up in class and to read orally in front of the class.

Although *SpeechViewer* was used primarily for individual speech improvement, it proved an effective "ice-breaker" at the beginning when groups of students explored its capabilities and, thus, received positive experiences in cooperative learning.

IBM *SpeechViewer* enabled the student to work independently on speech problems. The student found activities motivational and so was willing to independently select the program frequently and thus to realize a significant improvement in the ability to communicate orally.

b. *English Express*: *English Express* was used in conjunction with the CCP functional/academic core materials to further enhance the CCP Program as well as to provide students with additional stimuli to modalities not addressed in the CCP approach. The student found the "Zap It" computer activity from *English Express* particularly useful in enhancing concentration -- the student's weakest area. The *English Express* computer activities provided the student with a format that held the student's attention and thus effectively contributed to the growth of vocabulary, comprehension, and retention of material. This was accomplished by the multiple-encounter nature that was provided by interweaving the CCP materials and the *English Express* materials and activities. The student encountered the "categories" from the CCP materials in the *English Express* computer software and in the print materials. In addition, further exposure to the category words was made possible in group sessions using the laserdisc portion of Davidson's *English Express* program. The use of the multiple approaches worked extremely well with this student. The student benefited most in those areas where the student was unfamiliar with the category words and needed a variety of stimuli and a great deal of reinforcement.

c. *Micro-LADS* and IBM Programs: To review and enhance grammar, punctuation, and writing skills, the student first used the *Micro-LADS* program as well as the IBM software programs on punctuation and combining sentences. Using these programs with the student before going to print material proved highly effective in helping the student master the skills as well as improve motivation.

PARTICIPANT ID: H-002

October 15, 1991 - June 30, 1992

This student tested in September at 84 percent using the Academic ESL Test -- Form A (LAS Level 4), placing the student in the Basic Skills Tier 1.2 of the CCP Program. In January, the student's LAS Level 5 score was 91. Incorrect documentation had the student's age as 16 when the student was actually 13. An ARD requested by the parents found that the student should be placed in a regular sixth grade class rather than in a special class. However, the instructor noted that reading problems would have inhibited the student's success, even at the lower grade level, had the technology used in the lab not helped the student improve in reading comprehension and vocabulary. The student scored at the 2.5 level of the TABE E level in January. Although the instructor reported that the TABE E level exit exam was administered at the end of the year, no quantitative score was provided. The student was reported to be actively involved in the learning environment by the end of the year. Rather than sitting "staring into space", the student asked questions and joined in class activities without fear of embarrassment. The student also exhibited control of his/her own learning, not waiting for the teacher to assign work, but proceeding as the student saw appropriate. Self-esteem improved.

1. LEARNING STYLES/PROBLEM:

This student could read in Spanish but had extremely low comprehension when reading English text. While the student was tested for hearing problems, none were found. The student had difficulty processing auditory information, even with some Spanish translation. The student also had difficulty processing information from short-term to long-term memory. The student also had problems with pronunciation which inhibited her/his willingness to participate in class discussions or to interact socially with peers.

2. USE OF CCP/ESL CENTER:

Reading improvement was the primary focus for this student's use of the Center program. The student used *English Express* and IBM *SpeechViewer* extensively, with CCP print material being used for additional reinforcement. The computer

programs and other technologies enabled the student to work with course content using a variety of approaches and modalities. Thus, the student experienced greater retention of the material. Enhanced retention transferred from the technology-based activities to the print materials. The student needed less repetition in order to master material on the technology-based activities than the student had when instruction was more paper and orally based.

3. USE OF SUPPLEMENTAL ASSISTIVE TECHNOLOGY:

a. *IBM SpeechViewer*: The student used the "Voicing Onset" portion of the program successfully to correct speech patterns and phonetic problems. The program enabled the student to enhance auditory discrimination skills as well as to improve pronunciation. All instruction and practice in these areas was accomplished using the technology with further reinforcement and evaluation done with printed materials and through teacher-directed activities.

b. *English Express*: The "Zap It" program from *English Express* was used first to help the student develop retention skills. The computer activity was particularly useful in enhancing concentration by holding the student's attention and thus effectively contributed to the growth of vocabulary, comprehension, and retention of material. This was accomplished by the multiple-encounter capability that was provided by reinforcing the *English Express* materials and activities with corresponding activities using the *Q Solution*. The student encountered the "categories" from the *English Express* materials in the *Q Solution* materials, thereby getting additional reinforcement. The Franklin talking dictionary enabled additional auditory stimulus of the vocabulary words. In addition, further exposure to the category words was made possible in group sessions using the laserdisc portion of Davidson's *English Express* program. The use of the multiple approaches worked extremely well with this student. The student benefited most in those areas where the student was unfamiliar with the category words and needed a variety of stimuli and a great deal of reinforcement.

c. Creative Learning: *Breakthrough to Language* was used to develop a sense of English sentence structure. After the student had worked with content using *English Express* and *Q Solution*, the bar-codes of these programs for various words were copied and cut apart from each other so that the student

could use them to form sentences and then listen to, as well as write out, the sentences which had been created. CCP reader cards also provided additional practice.

October 15, 1991 - June 30, 1992

In September, this student scored 26 on the LAS Level 1, indicating a grade equivalent less than 1.7. In January, the student scored 43 on the LAS Level 1, indicating a grade equivalent of less than 2.4. The instructor noted a reading level of 1.4 at the beginning of the study. Where the student was painfully shy in the beginning and would not even verbalize in Spanish, the student became self-confident and readily joined into class activities and solicited positive peer interaction by the end of the study. The student came to exhibit self-motivation and pride in excelling at tasks. By the end of the year, the student transformed from a person who would not even attempt to speak English to a fluent English speaker.

1. LEARNING STYLES/PROBLEM:

This 12-year-old student refused to verbalize in either Spanish or English at the beginning of the year. Severe attention problems and low reading ability characterized the learner. In addition, the student needed constant prompting and reinforcement to stay on task. The student exhibited extreme fear of failure and fear of ridicule.

2. USE OF CCP/ESL CENTER:

The student's reading and oral skills were too low to place the student successfully on the CCP Program without heavy reliance on additional instructional approaches and activities. The student's program of study was structured to contain an oral exercise followed by a writing activity and ending in silent reading. The technologies that used voice were particularly effective. Activities based on the laserdisc portion of *English Express* used as a group activity provided the core instruction for this student, creating a motivational setting in which to vocalize with peers and the instructor. The *English Express* laserdisc and computer activities were then further enhanced by activities based on corresponding material from the *Q Solution* since the students, in general, at this site found the printed materials accompanying *English Express* too difficult.

3. USE OF SUPPLEMENTAL ASSISTIVE TECHNOLOGY:

a. *IBM SpeechViewer*, *English Express* "Language Master", and *Talk to Me*: These programs provided the student with self-paced, private feedback on oral skills while enhancing auditory discrimination skills. The programs helped the student overcome an inability to vocalize in front of others while it helped build self-confidence by offering a "safe" way to practice and improve oral skills and provided an alternative approach to reinforcing the vocabulary introduced through the laserdisc portion of *English Express*.

b. *English Express*: *English Express* was used in groups of two to five. Students viewed the material on the laserdisc, repeated the material orally, and then reinforced the category words in written and reading activities provided primarily in the *Q Solution* materials. The Franklin speaking dictionary offered further auditory reinforcement. The use of the multiple approaches worked extremely well with this student. The student benefited from being able to work with vocabulary in a variety of ways in order to build self-confidence and retention. The student needed a variety of stimuli and a great deal of reinforcement which the mix of approaches over the same material afforded.

c. *TouchWindow*: In the beginning, the student found this technology especially motivational and helpful. The *TouchWindow* made programs more accessible for this student, and thus the student was more willing to interact with them. As the student's self-confidence increased, the student used this device less frequently. By the end of the study, the student used the computer keyboard with all the programs and had stopped using the *TouchWindow*. But, the *TouchWindow* enabled the student to progress faster at the outset.

October 15, 1991 - June 29, 1992

In September, this student scored 27 using the Academic ESL Test -- Form A (LAS Level 1), giving the student a grade equivalent of less than 1.7. In January, the student's LAS Level 2 score was 60, or a grade equivalent of less than 3.1. The instructor provided no quantitative data to support end-of-the-year observations; however, the instructor noted enhanced positive attitude on the student's part. The student also progressed to having understandable oral and written use of English. While student productivity remained erratic when working alone, the student exhibited positive work habits when working with a peer or peers. The student did not complete the school year, opting to drop out of school and work as a farm laborer. The instructor notes that the student left the program with functional skills mastered, such as filling out forms and functional literacy.

1. LEARNING STYLES/PROBLEM:

This 14-year-old student could not read in Spanish or English at the outset of the study. Oral English skills were also very weak. However, the student's major problem was in attitude, perhaps caused in part by the frustration of finding tasks too difficult. This led to disruptive behavior which further engendered negative attitudes. The student's low reading level, 1.4, made comprehension difficult and increased the student's hostility.

2. USE OF CCP/ESL CENTER:

The student's low skill level made working on the CCP Program without close guidance difficult. While the student could have enhanced his/her learning by beginning with the voiced supplemental technologies offered through the study, the student's hostility to instructor directions made the student refuse to work on the voiced programs alone. The student overcame his/her hostility to the voiced programs when the activity was used with one or two peers; thus, the student's learning plan focused heavily on group activities as the core. Activities based on the laserdisc portion of *English Express* used as a group activity provided the core instruction for this student, creating a motivational setting in which to vocalize with peers and to capitalize on the

student's need for peer interaction and approval. The *English Express* laserdisc and computer activities were then further enhanced by activities based on corresponding material from the *Q Solution*, since the students in general at this site found the printed materials accompanying *English Express* too difficult.

3. USE OF SUPPLEMENTAL ASSISTIVE TECHNOLOGY:

a. *IBM SpeechViewer* and *English Express* "Language Master": The use of these programs was enhanced by permitting the student to work with at least one peer, and sometimes, when appropriate, with two. Although the other students in the study used these programs for private, self-paced feedback, this student needed peer interaction and feedback. Thus, the use of a peer provided additional monitoring and also, through the peer's use of the program, provided a further modeling of pronunciation.

b. *English Express*: *English Express* was used in groups of two to five to introduce the topics or categories. The student viewed the material on the laserdisc and repeated the material orally in the larger group and then later with a peer tutor. Paired with another student, this student then reinforced the category words in oral, written, and reading activities provided primarily in the *Q Solution* materials. The Franklin speaking dictionary offered further auditory reinforcement and oral reinforcement with a peer or peers.

c. *Micro-LADS*: These activities, also used with a peer to further the student's learning, enhanced the student's grasp of the structure of the English language and offered additional reinforcement in such areas of student difficulty as prepositional phrases.

October 15, 1991 - June 30, 1992

In September, this student scored 29 on the LAS Level 1, placing the learner at a grade equivalency below 1.7. In January, the student scored 53 on the LAS Level 1, giving the student a grade equivalence of below 2.4. The student exited the program with a score of 88.57 or a LAS Level 4 ("Fluent English Speaker"). The student ended the year capable of handling CCP Tier 1. The instructor noted significant behavioral changes in the student in addition to academic growth. The student became very open and helpful in class. The student also began to take great pride in his/her oral English and other class-related abilities. Thus, the student accepted responsibility for his/her own work and actions as well as assuming a leadership role in the class, as opposed to isolating him/herself from other students as the student did at the beginning of the year.

1. LEARNING STYLES/PROBLEM:

This 14-year-old student could neither read in Spanish nor in English at the outset of the study. Oral skills in English were poor and the student had difficulty pronouncing English words and phrases. Furthermore, the student was easily distracted and had difficulty staying on task. Both literal and conceptual understanding of English vocabulary was very poor. Weak English skills made the student reluctant to interact with the class. Self-esteem and self-confidence were low.

2. USE OF CCP/ESL CENTER:

The student needed strong and consistent feedback on oral skills. The laserdisc portion of the *English Express* program, used with small groups of two to five, provided the student with a highly motivational and non-threatening environment in which to naturally use oral English. This was the core of the student's instructional program. The *English Express* laserdisc and computer activities were then further enhanced by activities based on corresponding material from the *Q Solution*, since the students in general at this site found the printed materials accompanying *English Express*

too difficult. As supplemental resources, the CCP functional materials were helpful.

3. USE OF SUPPLEMENTAL ASSISTIVE TECHNOLOGY:

a. *IBM SpeechViewer*, *English Express* "Language Master", and "Talk to Me": These programs provided the student with self-paced, private feedback on oral skills while enhancing auditory discrimination skills. The programs helped the student overcome an inability to vocalize in front of others while they helped build self-confidence by offering a "safe" way to practice and improve oral skills. These programs also provided alternative approaches to reinforcing the vocabulary introduced through the laserdisc portion of *English Express*. In addition, *SpeechViewer* helped the student correct slurs in speech and encouraged the student to speak louder.

b. *English Express*: *English Express* was used in groups of two to five. Students viewed the material on the laserdisc, repeated the material orally, and then this student further reinforced correct pronunciation, working with a peer. Work with the *Q Solution*, in conjunction with a peer, provided additional and varied reinforcement in building basic vocabulary skills. The student scanned a word, listening to the pronunciation, and verbalized it to the partner. The partner followed the same pattern.

c. *Micro-LADS*, "Talk to Me", and *TouchWindow*: Activities for these programs enhanced the student's grasp of the structure of the English language and offered additional reinforcement. For example, the student grasped prepositional phrases quickly with the use of *Micro-LADS*. *Talk to Me* also proved useful in developing the student's sense of English sentence structure, as did the programs which used the *TouchWindow*. The instructor noted that the *TouchWindow* was especially effective in developing the student's ability to recognize English sentences.

October 12, 1991 - June 26, 1992

This student was a 16-year-old tenth grader for whom Spanish was the native language. The student could read at an upper first grade level in both English and Spanish by the end of the school year, reflecting little academic achievement. The student's handicaps prevented him/her from progressing very rapidly. The instructor, however, noted that the student was more willing to join in class interactions by the end of the study. By the end of the study, the student was more willing to participate and vocalize, especially if working in a one-on-one situation.

1. LEARNING STYLES/PROBLEM:

At the beginning of the study, the student was very withdrawn and reluctant to verbalize. This student required close supervision and thus was assigned a full-time aide. The student had poor short-term auditory memory. Visual sequencing and visual motor abilities were also very weak. The student required a calm, structured learning environment. Learning was facilitated for this student when the learner was provided with a verbal explanation and a visual demonstration. A major obstacle to the student's academic progress was a relatively high absentee rate due to illness.

2. USE OF CCP/ESL CENTER:

Together, this student and the aide would listen to the CCP Program tapes, with the aide periodically stopping the tape to get a response from the student in order to verify understanding. The aide also provided additional practice and reinforcement by developing additional worksheets that corresponded to the material on the CCP tapes. Further reinforcement was provided by selecting *English Express* materials and technology-based activities which corresponded and reinforced the material on the CCP tapes. The CCP software was employed in a similar fashion, thus developing extended and varied forms of instruction and practice on the CCP content. In addition, *STAR* enabled the student to acquire additional vocabulary skills.

3. USE OF SUPPLEMENTAL ASSISTIVE TECHNOLOGY:

- a. *IBM SpeechViewer*: The student used this program with a peer tutor to successfully assist the student in increasing voice volume.
- b. *English Express*: The student worked with the aide or a peer tutor on the software portions of the program. These activities from *English Express* provided reinforcement of the content introduced in the CCP Program. The multi-modal nature and varied formats engaged the student's attention and made him/her less reluctant to vocalize.
- c. *STAR*: The clean screens and carefully structured lessons of this program provided the student with a wealth of reinforcement using a variety of modalities and in a variety of subject areas -- vocabulary, spelling, usage, and writing. The lack of distractions and the interwoven nature of the content presentation made the program highly successful with this student.

PARTICIPANT ID: W-002

October 12, 1991 - June 26, 1992

Although no quantitative data was available to support student achievement, qualitative data from the instructor suggests that the student began the year very motivated, but lost interest in the CCP materials as the year progressed. The supplemental software, on the other hand, held the student's interest throughout the year. By engaging the student's attention, the supplemental programs were able to enhance the student's grasp of the concepts presented in class. This, in turn, enabled the student to maintain test scores in the 80-90 range, which fostered the student's self-confidence and self-esteem. By the end of the year, the student had sufficiently mastered grammar to successfully act as a peer tutor with some of the other students, an indication of his/her need for less close supervision by the instructor.

1. LEARNING STYLES/PROBLEM:

This 16-year-old student had recently arrived from Africa, where the student had completed a third grade education before being taken out of school for seven years. Although the student was bilingual, his/her reading skills were at the first grade level and the student frequently had trouble with English grammar, especially verbs. Slow at completing tasks and often unable to understand concepts, such as more and less, the student required close supervision. In addition, the student tended to confuse "b" and "d" when reading, adding to the student's comprehension problem. The student required visual stimulus in order to facilitate his/her answers. A lack of self-confidence also hindered the student's learning.

2. USE OF CCP/ESL CENTER:

This student had particular difficulty understanding material as it was presented in the CCP Program, especially the use of the CCP tapes, which the student finally refused to use. As the CCP materials increased in difficulty, the student's ability to understand decreased, causing frustration. This necessitated intervention by the instructor, who had to go over the material and expand on it to ensure comprehension.

Without the supplemental technology-based materials, the student would have had an extremely difficult time. By providing additional and multi-sensory reinforcement, the supplemental programs facilitated the student's learning. In addition, certain programs also provided targeted practice in such areas as grammar, which the student needed.

3. USE OF SUPPLEMENTAL ASSISTIVE TECHNOLOGY:

a. *English Express*: The student needed a variety of stimuli and a great deal of reinforcement which *English Express* afforded. The mix of approaches over the same material engaged the student through the sheer variety of activities while it also enabled the student to receive the necessary amount of visual stimulation required for the student to learn. By supplementing the CCP content with corresponding content from *English Express*, the instructor also found the time needed to spend individual time with students, especially this student.

b. *Breakthrough to Language*: This multi-sensory approach to building skills and understanding in grammar was particularly effective with this student who needs to have a great deal of visual stimuli. The more modalities involved, the greater this student's involvement, in general. Thus, the success of this program in decreasing this student's incorrect use of grammar, especially verbs.

c. *STAR* and *Lexia Touch & Learn*: These programs further enhanced the student's reading skills. Through *STAR*, the student encountered a carefully structured and reinforced approach to building comprehension skills. *STAR* reinforced comprehension through vocabulary, spelling, usage, and writing exercises that enabled the student to work with the same content. The use of voice and graphics to further learning was particularly appealing to this student. The student received additional instruction and practice in decoding skills through the *Lexia* program which the student worked on with the instructor's supervision.

October 12, 1991 - June 26, 1992

Despite the lack of concrete quantitative data indicating academic and social improvement for this student, the instructor noted that the student was more willing to read aloud as well as to work cooperatively with peers -- tasks in which he/she formally worked alone, embarrassed at his/her lack of skills. The student was able to stay on task 80 percent of the time by the end of the study, in spite of the student's short attention span. The instructor noted that the student needed 50 percent less praise from the teacher than when the school year began.

1. LEARNING STYLES/PROBLEM:

This 15-year-old tenth grade student had severe emotional problems which inhibit academic and social progress. Spanish was the student's native language, and the student's English was not always clear. Thus, the student tended to slur words both when the student was being lazy and when the student was unsure of the correct English pronunciation. The WISC-R, administered June 15, 1990, placed the student on the borderline of intellectual ability (EMR). Testing revealed that the student had strengths in non-verbal and visual-motor tasks, non-verbal reasoning with eye-hand coordination, and cultural and social general knowledge. The student's weaknesses included auditory memory, verbal expression, language, and reading. The student learned best when materials were presented visually with demonstration and opportunities for practice and regular review. Although the student responded to praise and understood how to set limits with the corresponding consequences, the student tested limits.

2. USE OF CCP/ESL CENTER:

The CCP materials formed the core of this student's instruction. The student required a great deal of reinforcement, so the instructor focused the student's class time to working on those skills which were giving the student the most difficulty, selecting from among the CCP materials and then supplementing them with the supplemental programs. The student's need for information and content to be presented visually was a handicap with the CCP

tapes, wherein the student had to listen to each many times before grasping the concepts being introduced. The opportunity to supplement with other materials enhanced the student's learning, as did discussions with staff members to verify understanding.

3. USE OF SUPPLEMENTAL ASSISTIVE TECHNOLOGY:

a. *IBM SpeechViewer* and *English Express "Language Master"*: These programs enabled the student to work at pronunciation in private and at his/her own pace. The programs also afforded the student the opportunity to further reinforce vocabulary and concepts which were introduced in the CCP Program. Both programs also presented instruction and practice in such a way that several modalities came into play, further strengthening learning for this student. The vowel accuracy component of *SpeechViewer* was of particular help in aiding the student in improving his/her speech.

b. *Lexia Touch & Learn*: This program provided the student with motivating practice in decoding skills, an area in which the student was very weak. The Lexia program broke the skills into easy-to-understand parts and embedded practice in highly engaging activities, which even this student with his/her limited attention span worked on for extended periods of time, further enhancing skills. Using a game format and small steps, the program was very effective for low-functioning learners.

c. CCP Software: The student found the CCP software programs good for the multiple repetitions of information needed for mastery. This software enhanced the instruction on the CCP tapes and, along with the *English Express* programs and laserdisc material, further extended learning -- stimulating multiple senses while doing so.

November 11, 1991 - May 1992

The CCP/ESL functional testing score this learner received early at the outset of the study was 14 percent; the final, end-of-year score was 68 percent. The instructor reported increased competency in the language skills associated with the Functional Module of the CCP/ESL Program, notably in reading improvement. The instructor also noted an observed increase in the amount and frequency of English use by this learner outside the classroom.

1. LEARNING STYLES/PROBLEM:

This native Spanish speaker entered the study with a deficient academic background, and thus had difficulty reading in Spanish at grade level. A slow learner with extremely weak linguistic skills in English, the learner also exhibited articulation problems for which the learner was receiving training from a speech pathologist. A visual and audio learner, the subject learned best when provided with ample visual stimuli, modeling, and extended opportunities to practice. Additionally, the learner did not work well alone and was easily distracted. His learning disability was such that self-correcting was difficult, so the instructor needed to monitor progress closely. Positive factors influencing the learner's growth were the learner's innate self-confidence and outgoing personality.

2. USE OF CCP/ESL CENTER:

The CCP/ESL materials formed the basic core of the instructional time in the CCP/ESL Center; however, learning was also supported by a strong, instructional curriculum in all subject areas throughout the regular school day. The instructor adhered closely to the recommended use of the materials, supplementing with the assistive materials to handle specific individual learner problems not addressed in the core materials and to provide additional practice for those who need intensive repetition. The supplementary materials also provided variety.

3. USE OF SUPPLEMENTAL ASSISTIVE TECHNOLOGY:

a. *Micro-LADS*: The learner used this program to ensure sufficient practice in usage concepts. The learner would complete corresponding sections in the CCP/ESL Program materials, and then reinforce the skills and information using *Micro-LADS*.

b. *Optimum Resource Reading Program*: This program not only proved effective in enhancing English pronunciation for this student, but assisted the learner in improving decoding skills. The visual and audio combination provided by the *Optimum Resource Reading Program* further enhanced learning by addressing the learner's two strongest modalities in combination. The uncluttered screens kept distractions to a minimum. This program, in conjunction with *Micro-LADS*, provided enough variety to the CCP/ESL Program to hold the learner's attention and reduced to a minimum the need for instructor intervention to keep the learner on task.

October 7, 1991 - May 1992

The learner obtained a CCP/ESL functional test score of 68 percent in mid-October and a final, end-of-year score of 88 percent. The instructor reported an increase in functional language skills during the period of the study. Although this learner entered the program with a strong self-concept, the instructor observed enhanced self-esteem as the learner's language skills improved.

1. LEARNING STYLES/PROBLEM:

This learner came from a Spanish-speaking background and exhibited a poor grasp of English linguistic skills. Categorized as a "slow learner", the subject acquired information and skills best when a multi-sensory approach was used. The learner's dominant modalities, however, were audio and visual. Extended practice was also necessary in order to master material. The learner was distracted at times, especially when an activity the learner was working on in another subject area was especially interesting to the learner. The instruction provided in the CCP/ESL Center was further supported by a full schedule of classes during the school day.

2. USE OF CCP/ESL CENTER:

The CCP/ESL materials formed the basic core of the instructional time in the CCP/ESL Center with the instructor closely following the recommended use of the materials. In order to better address the dominant learning modalities of this learner and to provide as multi-sensory and as varied a learning environment as possible, the instructor supplemented the CCP/ESL materials with the assistive technologies. The assistive materials also enabled the extensive reinforcement this learner required in order to master skills and concepts.

3. USE OF SUPPLEMENTAL ASSISTIVE TECHNOLOGY:

a. *Micro-LADS*: *Micro-LADS* provided a multi-sensory environment in which this learner could practice and enhance important usage skills and concepts. The

instructor was careful to have the student use the program when the material best reinforced the material the learner was working on in the CCP/ESL Program.

b. *Optimum Resource Reading Program*: The emphasis on audio and visual learning combined in this program proved extremely effective for this learner since these modalities were the learner's strongest. Using the *Optimum Resource Reading Program* in conjunction with *Micro-LADS* and the CCP/ESL Program enabled the learner to encounter information in varied formats and provided the extended practice using a multi-sensory approach that ensured significant learning would occur.

October 7, 1991 - May 1992

The learner scored 54 percent in mid-October on the CCP/ESL functional test and increased the score to 72 percent by the end of the school year. The instructor reported an increase in the learner's use of functional language skills and an increase in reading comprehension.

1. LEARNING STYLES/PROBLEM:

A "slow learner", this student lacked basic reading skills in both English and the learner's native Spanish. The learner, however, progressed enough during the year to be mainstreamed in mathematics. The learner had difficulty with reading comprehension. The learner was, however, self-motivated and required little instructor supervision to stay on task.

2. USE OF CCP/ESL CENTER:

The CCP/ESL materials formed the basic core of the instructional time in the CCP/ESL Center with the instructor closely following the recommended use of the materials. The instructor worked closely with this student with content reading in science and social studies -- two other classes which demanded high competence in reading comprehension. The procedure involved the learner reading the science or social studies textbook aloud and the instructor translating and explaining the meaning. This was followed by a question-and-answer period to further ensure comprehension. The assistive technology programs provided variety as well as extended reinforcement to the CCP/ESL Program. These programs also proved effective in enhancing the learner's pronunciation skills.

3. USE OF SUPPLEMENTAL ASSISTIVE TECHNOLOGY:

a. *Micro-LADS*: *Micro-LADS* ensured that this learner had ample opportunity to practice the material and concepts presented within the CCP/ESL Program. *Micro-LADS* also enabled the learner to encounter the same material using a variety of modalities.

b. *Optimum Resource Reading Program*: In addition to providing variety and addressing additional modalities, this program provided the learner with the feedback necessary to become more self-correcting. The uncluttered screen and strong auditory and visual stimuli in the program focused the learner's attention on the material encountered in the CCP/ESL Program.

c. Franklin's dictionary: This hand-held talking electronic dictionary engaged the learner's attention with its novelty and its ability to provide immediate access to information. It proved both motivational and reduced the number of times the learner needed to seek the instructor's assistance.

October 7, 1991 - May 1992

The learner increased his/her score on the CCP/ESL functional test from 24 percent in mid-October to 54 percent by the end of the school year. The instructor noted that the learner's functional vocabulary did show modest gains and that pronunciation improved during the course of the study. Self-concept remained low through the project.

1. LEARNING STYLES/PROBLEM:

The learner arrived from Puerto Rico without an IEP, but had been receiving special education services in school there. Assessment at the present site found weak verbal and mathematics skills as well as attention deficiency. Immaturity and a slight speech impediment (a lisp) further hindered progress. Additionally, unresolved psychological problems continued to prove an obstacle to the learner's focusing sufficient cognitive energies on classroom learning tasks. The learner exhibited a strong preference for auditory learning tasks, and avoided visual modalities.

2. USE OF CCP/ESL CENTER:

The instructor followed the guidelines for using the CCP/ESL materials which formed the basic core of the instructional time in the CCP/ESL Center. However, for this learner, due to attention problems, lessons had to be shortened. The instructor focused learning tasks on the audio tapes and the Language Master cards to facilitate the subject's learning preference.

3. USE OF SUPPLEMENTAL ASSISTIVE TECHNOLOGY:

The learner refused to use the assistive technology programs, preferring the audio programs that accompany the CCP/ESL program.

October 7, 1991 - May 1992

The learner scored 48 percent in mid-October on the CCP/ESL functional test and increased the score to 81 percent by the end of the school year. The instructor noted improvement in functional literacy skills by the end of the study, as well as a significant increase in the learner's ability to use English both inside and outside the classroom. In addition, the learner has shown increased initiative in other academic areas, taking extra work home in his/her social studies and science textbooks, both of which are in English.

1. LEARNING STYLES/PROBLEM:

This learner is a border-line "slow learner", with specific problems in the areas of mathematics and reading comprehension. A multi-sensory approach worked best for this learner. Modeling of tasks and visual aides also improved learning. This learner could work successfully alone but needed extensive opportunities for practice and reinforcement. Further, learning in the CCP/ESL Center was supported by a full academic course load within a structured formal education environment.

2. USE OF CCP/ESL CENTER:

The CCP/ESL materials formed the basic core of the instructional time in the CCP/ESL Center with the instructor closely following the recommended use of the materials. Supplementary assistive programs addressed multiple modalities and provided variety as well as further opportunities for practice and reinforcement.

3. USE OF SUPPLEMENTAL ASSISTIVE TECHNOLOGY:

a. *Micro-LADS*: *Micro-LADS* ensured that this learner had ample opportunity to practice the material and concepts presented within the CCP/ESL Program. *Micro-LADS* also enabled the learner to encounter the same material using a variety of modalities.

b. *Optimum Resource Reading Program*: In addition to providing variety and addressing additional modalities, this program provided the learner with the feedback necessary to become more self-correcting. The program also enabled further extensive practice, which enhanced the learner's grasp of the material. The self-control that the learner experienced while using the assistive programs proved beneficial to self-esteem.

October 7, 1991 - June 30, 1992

This student received a score of 60 percent on the CCP assessment test in October. By mid-January, this subject increased this score to 79 percent. The instructor reported that the learner's functional English improved significantly during the study and that the learner achieved greater independence. Self-esteem and self-confidence blossomed with the learner's increased facility with English.

1. LEARNING STYLES/PROBLEM:

The subject was a slow learner with specific problems in the area of abstract reasoning. A native-Spanish speaker, the subject required a multi-sensory approach that included careful modeling of a task and a great deal of repetition. Shy and self-conscious, the learner often withdrew from classroom exchanges, too shy to join in the verbal banter that is typical of adolescents. While the learner was well motivated, he/she needed frequent monitoring to ensure understanding of an assigned task as well as to aid in catching errors. An extended illness at the beginning of school delayed the learner's working with the supplemental technology-based materials.

2. USE OF CCP/ESL CENTER:

In preparation for the learner's working on a CCP or technology-based lesson, the instructor thoroughly explained the program and what the learner could expect. While this facilitated the learner's ability to work more independently, the subject still required some on-going monitoring to ensure understanding of the task. The supplemental programs were employed as additional reinforcement of skills and content introduced in the CCP Program. The supplemental programs also enabled a more multi-sensory approach while they provided the learner with the opportunity to explore the same content in a variety of contexts.

3. USE OF SUPPLEMENTAL ASSISTIVE TECHNOLOGY:

a. *Optimum Resource Reading Program*: This program provided additional, multi-sensory reinforcement for this student. The ability to hear the sounds and then to repeat them as the program demanded furthered the student's growing facility with English as well as enhancing reading skills.

b. *Micro-LADS*: To review and enhance grammar, punctuation, and writing skills, the student first used the *Micro-LADS* program. This program provided the opportunity to work intensively with a grammar concept using multiple modalities. Thus, after completing the CCP section covering a particular grammar skill or concept, the learner then received the depth of practice using a multi-sensory approach which further ensured mastery.

PARTICIPANT ID: A-001

November 18, 1991 - June 17, 1992

The learner's best score in November was a 5 and the best score in June was a 17. The instructor notes that learner's auditory comprehension improved as did the learner's ability to concentrate on a single task. While the learner's progress was extremely slow, the learner was observed to participate more in class by the end of the study, although self-esteem was still low and the learner continued to use Spanish rather than English outside the class. Even by the end of the study, the learner could not work independently on the software or assistive devices. The learner needed constant reassurance and had difficulty moving from one word to the next. The learner's limited progress may be a function of the severe lack of skills and education the learner possessed at the beginning of the study.

1. LEARNING STYLES/PROBLEM:

The learner's auditory comprehension was very low. The learner repeated instructions when given. He/she mixed Spanish together with English within a fluent stream of speech as if he/she failed to make a distinction between the two languages. Sometimes one sentence would be in both languages. The learner had a short attention span, and the learner's short-term memory appeared to be weak. The learner exhibited little retention of learning between sessions. Keenly aware of his/her lack of education and weak grasp of English, the learner's self-esteem and self-concept were low. While the learner was reliable and determined, the learner lacked the self-confidence and initiative to attempt to speak English outside the classroom environment.

2. USE OF CCP/ESL CENTER:

The learner attended evening ESL classes, Monday through Thursday from 6:00-8:30 p.m. The assistive technology materials were used to supplement the competency-based lessons in the classroom. The tutor and the evening teacher worked together closely to choose software and other instructional material which met the learner's needs.

3. USE OF SUPPLEMENTAL ASSISTIVE TECHNOLOGY:

- a. *IBM SpeechViewer*: In the beginning, the learner had difficulty using this software; however, with the help of an instructional assistant, the learner used Speech Module D in the voicing exercise with positive results in improving vowel accuracy.
- b. *English Express*: "Speech Master": At the outset of the study, this program was used for visual cues; however, the program had to be simplified because the learner had difficulty responding to simultaneous stimuli. As the project progressed, the learner worked with a tutor on the "Speak Out" drills. Since the vocabulary used in the *English Express* program corresponded to that used in the CCP lessons, the learner received additional reinforcement in a variety of modalities which would not have been possible with the CCP materials alone. The teacher noted that the learner participated more in class after working on this program.
- c. *English Express*: "Language Builder": Despite the learner's slow pace, the learner enjoyed working on the spelling component of this program; however, the learner had to work with a tutor before practicing a drill on his/her own.
- d. Touch Typing and *Eye Relief*: Touch Typing made the learner more comfortable with keyboarding while it provided another context in which to practice the names of letters as well as pronouncing their sounds. These skills were also further reinforced working with a tutor on *Eye Relief*.
- e. *STAR*: Although the learner tested into Level One of *STAR*, he/she found it too difficult without a tutor to translate and clarify directions at each stage of an exercise.

PARTICIPANT ID: A-002

November 18, 1991 - June 17, 1992

The best score obtained by the learner at the beginning of the study was a 34. The best score obtained at the end of the study was a 40. The learner had been coming to the learning center for the two years previous to the implementation of the study. When the learner first entered the program, he/she did not know the alphabet. Within 12 months, the learner was reading. During the period of the study, the learner showed significant improvement in reading and writing skills. One indication of this improvement was a reduction in the number of letters transposed when reading and writing. Another indication was an increase in such study skills as using the dictionary to check spelling in job-related tasks. Growing self-confidence as a learner even prompted the subject to challenge peers on such academic issues as his/her spelling.

1. LEARNING STYLES/PROBLEM:

Although Spanish was this subject's native language, the learner's oral proficiency in English was very high. The subject suffered from a learning disability which involved his/her reading and which manifested itself in the learner's transposing letters in words when reading and writing. The learner also had difficulty with sound/symbol relationships. This subject, however, was very motivated and had strong self-esteem.

2. USE OF CCP/ESL CENTER:

The learner "tested out" of the CCP/ESL Program; however, his/her learning disability, which involved a serious reading problem, could not be adequately addressed by the CCP/ESL Program. While the learner's proficiency with English was such that the learner could handle the competencies in the Functional Strand of the CCP/ESL Program, the learner's developmental reading needs were not met by the Academic Strand of this program. Thus, the learner's educational experiences in the learning center focused on the assistive software and on reading beginning and beginning-intermediate ESL readers. By selecting and integrating various sections and components of IBM *SpeechViewer*, *English Express*, and *STAR*, the staff was able to create an

individualized learning program for this learner that enabled not only sufficient practice and reinforcement in a variety of contexts, but also in multiple modalities.

3. USE OF SUPPLEMENTAL ASSISTIVE TECHNOLOGY:

a. *IBM SpeechViewer*: The learner benefited from the Voicing Onset module, Vowel Accuracy, and Vowel Contrasting modules -- all of which addressed the learner's problem with sound/symbol associations. Using the Voicing Onset module, the learner worked in isolation on +voice and -voice phonemes. Sound/symbol correspondence for various English sounds were reinforced and practiced effectively using the Vowel Accuracy and Vowel Contrasting modules.

b. *English Express*: "SpeechMaster"/"Language Builder": Used in individual sessions with the center assistant facilitating its use, "SpeechMaster" further enhanced and extended the Vowel Accuracy learning experiences from *SpeechViewer*. After working intensely with *SpeechViewer*, the learner was then able to hear and then spell new vocabulary, often without seeing the actual word on the screen. "Language Builder", then, provided the learner with additional practice with writing. This sequence of *SpeechViewer*, followed by "Speech Master" and then "Language Builder", gave the learner a variety of experiences, as well as the opportunity to learn through multiple modalities.

c. *STAR*: The learner tested into the *STAR* program at Level Three, and completed six discs by the close of the study. *STAR* provided a highly structured, sight-word approach to reading. Vocabulary and spelling exercises were voiced in this program, and exercises were short. Screens were uncluttered, further enhancing learning for learners with visual information processing problems. This highly integrated and very multi-modal approach motivated the learner so that it was common for him/her to repeat a lesson as often as necessary -- as much as five times -- in order to obtain a score of 100 percent.

PARTICIPANT ID: A-003

October 21, 1991 - June 21, 1992

The best score obtained by the learner at the beginning of the study was a 35. The best score obtained at the end of the study was a 34. Although this would indicate a negative effect for the time spent in the learning center, the learner's disability was such that it was not readily measured, and thus the score does not reflect a true assessment of the learner's growth. The staff at the learning center reported a significant improvement in the learner's pronunciation. By the end of the study, the learner had corrected his/her use of vowels in normal conversational speech, and the learner was making progress in pronouncing final consonants. At the close of the project, the learner was also able to self-correct pronunciation -- an important advancement in remediating speech problems. Furthermore, the learner's self-confidence increased significantly. Thus, the learner more readily participated in and initiated conversation. Utterances became longer. The learner also began to take pride in co-workers' increasing ability to understand his/her speech.

1. LEARNING STYLES/PROBLEM:

The learner came to the learning center already bilingual in two Asian languages: Cantonese and Vietnamese. Both of these languages are tonal languages where meaning or definition of a "word" is dependent on pitch and tone. For example, the same "word" spoken at one pitch and/or tone may have one meaning, but spoken at another pitch and/or tone will have a completely different meaning. Interference from the two languages already mastered may have been at the root of the learner's articulation problem. Nevertheless, the learner "tested out" of the CCP/ESL Program. Although his/her writing and reading skills were too advanced to be addressed by the CCP/ESL curriculum, the learner's articulation problems interfered with his/her progress. The communication problems involved poor articulation, resulting in others having difficulty understanding this subject. This subject learned best through drill exercises, which enabled the learner to be self-monitoring.

2. USE OF CCP/ESL CENTER:

The CCP/ESL Program did not offer remediation for articulation problems. The learner's skills in reading and writing were more advanced than the material presented in the Academic Strand of the CCP/ESL. Thus, neither the Functional or the Academic Strands of the CCP Program met the learner's needs. The supplementary assistive technology programs, however, did provide practice and instruction in the areas of deficiency. By selecting sections from the various assistive programs, the staff was able to develop a highly individualized curriculum for this learner, a curriculum which provided diversity in approach and method as well as depth in practice exercises.

3. USE OF SUPPLEMENTAL ASSISTIVE TECHNOLOGY:

a. *IBM SpeechViewer*: *SpeechViewer* activities provided the learner with opportunities to not only correct articulation problems, but also to build self-correcting skills. The Vowel Accuracy activity provided practice in the eight English vowel sounds. The Pitch and Loudness patterning exercises were used with minimal pairs to teach articulation and differentiation. These exercises also promoted correct pronunciation of voiced and voiceless sibilants and dental fricatives. Through the practice provided in these exercises, the learner was able to work on onset voicing and loudness of voicing. Working with the *SpeechViewer* activities, the learner became aware of the differences between English pronunciation and the use of tone and pitch in the original two language he/she spoke -- Cantonese and Vietnamese.

b. *English Express*: "SpeechMaster"/"Language Builder": While *SpeechViewer* activities formed the core of the learner's curriculum, selected activities drawn from *English Express* permitted the learner the opportunity to enhance auditory discrimination skills as well as to compare his/her pronunciation with the pronunciation of the model speaker. "Language Builder" strengthened the learner's pronunciation, as well as provided a means to further build vocabulary skills. The sentence component part of the "Speak Out" activity enabled needed practice in accent and fluency. In conjunction with *SpeechViewer*, *English Express* exercises increased the modalities addressed in the individualized curriculum which the learning center staff developed for this learner.

c. *Eye Relief*: Using the *Keystrokes to Literacy* approach developed by the Playing to Win group in New York, the staff created exercises in the *Eye Relief* word processor which engaged the learner in literacy activities while strengthening written composition skills and providing a conversation stimulus. Working with a specially trained learning center volunteer, the learner articulated composition ideas, brainstormed, and performed other composition activities out loud, thereby not only increasing literacy and keyboarding skills, but also enhancing verbal skills. The composition activities using *Eye Relief* balanced and enhanced the work the student was doing in *SpeechViewer* and *English Express*.

November 20, 1991 - June 17, 1992

The best score obtained by the learner at the beginning of the study was a 12. The best score obtained at the end of the study was a 19. The learner exhibited marked improvement in the early months of the project, but made little or no progress in the final few weeks of the study. While the learner's pronunciation accuracy and ability to self-monitor increased, his/her fluency remained minimal. The learner's lack of improvement in pronunciation, as well as literacy skills, may be attributed to the limited amount of time (one hour per week) that the learner spent in the learning center. Other possible explanations for the lack of progress may be the learner's continuing dependence on the teaching staff and his/her need for their attention and positive feedback which inhibits his/her self-motivation. The inability of the materials available in the center to address all the sounds, such as fricatives, with which the learner needed help or to provide practice at the depth needed may be another contributing factors to the learner's slow progress toward the end of the study.

1. LEARNING STYLES/PROBLEM:

The learner's native Chinese language employs tone and pitch to differentiate meanings in otherwise similar-sounding words. Thus, pronunciation of English words is difficult. Vowels were problematic for this learner. The learner also had difficulty differentiating between /l/ and /r/ and with speaking too softly. This learner often left off the endings of words and frequently had problems paying attention.

2. USE OF CCP/ESL CENTER:

The learner could not use the CCP/ESL Program materials without close supervision of learning center staff and volunteers. Thus, the learner was assigned specific times to work with staff using the CCP/ESL Program binder and interactive audio tapes. CCP/ESL materials were then supported and further enhanced with assistive technology that addressed additional modalities while they provided greater depth of practice in the pronunciation and literacy skills the learner lacked.

3. USE OF SUPPLEMENTAL ASSISTIVE TECHNOLOGY:

a. *IBM SpeechViewer*: The learner modeled well and so benefited from *SpeechViewer* exercises. The Sound Awareness activity increased the learner's awareness of his/her problem with speaking too softly. The Vowel Accuracy activity enabled the student to practice vocalic sounds in isolation. The pitch and loudness patterning exercise provided practice in contrasting /l/ and /r/ in minimal pairs. The learner improved his/her pronunciation of voiced and voiceless consonants using the Voicing Onset activity.

b. *English Express*: "SpeechMaster"/"Language Builder": "Language Builder" was used largely for the spelling exercises, which the learner found a lot of success in completing. The spelling section provided further reinforcement for the vocabulary introduced through the CCP/ESL modules while these spelling activities increased the learner's awareness of the structure of English words. "SpeechMaster" proved exceptionally useful in enabling the learner to get immediate feedback on pronunciation. Self-monitoring skills were enhanced through comparisons between the learner's pronunciation and that of the model voices. The learner needed one-on-one assistance from a staff member or volunteer to work on these programs, however.

c. *Eye Relief*: The learner used the program in the early months of the project as a means of reinforcing vocabulary. The tactile stimulus of typing the words, followed by the verbal and auditory stimuli of pronouncing the words for the staff member assisting the learner, provided vital practice. The learner then printed the vocabulary words to take home and practice between sessions at the learning center.

d. *STAR*: In the beginning of the project, this program provided a stimulating environment in which the learner repeated each vocabulary word presented after hearing the program pronounce it. Although this was not the intended use of the program by the publisher, using *STAR* to provide an additional forum in which to practice pronunciation proved effective.

PARTICIPANT ID: A-005

October 20, 1991 - June 21, 1992

The best score obtained by the learner at the beginning of the study was a 10. The best score obtained at the end of the study was a 14. The learner's progress was extremely slow, and the learner needed intensive one-on-one help from learning center staff and volunteers to make even minimal progress. However, by the end of the study, the learner's reading comprehension had improved, as had the learner's ability to associate sounds with the appropriate symbols. The learner's self-confidence also increased as his/her ability to express him-/herself in English improved.

1. LEARNING STYLES/PROBLEM:

This native Spanish speaker had no previous education in his/her native country. Although the learner was fiercely committed to learning, difficulty with retention and lack of any formal education hindered progress. The learner found it difficult to isolate and identify significant words which he/she heard. The learner was also unable to make the connection between two words from different languages representing the same idea. The learner's low functioning level prevented working independently. Furthermore, the learner needed excessive repetition in order to learn. Finally, the learner avoided tasks on the computer at first until the learner was diagnosed as needing glasses. Glasses improved vision; however, the learner remained hesitant to use the computer, preferring the CCP/ESL program Language Master activities.

2. USE OF CCP/ESL CENTER:

In the early stages of the study, the learner needed constant supervision to use the CCP/ESL Program materials as the learner had no idea when a task was complete. Being illiterate in his/her native language, the learner could not follow the instructions on the CCP/ESL audio tapes or in the printed materials. However, by the end of the project, the learner was able to use the CCP/ESL Language Master cards and the activity sheets without assistance. The staff augmented the CCP/ESL materials by putting the beginning-level reader sentences on Language Master cards to provide further practice. In addition to the Language Master cards, the staff created cards for everyday

items, such as foods, clothing, and money, since the learner was highly motivated to use the Language Master and benefited from practice using this device.

3. USE OF SUPPLEMENTAL ASSISTIVE TECHNOLOGY:

a. *Micro-LADS*: This program provided solid and useful work in the areas of prepositions as well as singulars and plurals. The staff supplemented these activities with Language Master cards they created to provide additional practice.

b. *Conover's Signs in the Workplace*: The Information Signs I and II and the Safety Signs I and II proved particularly helpful for this learner. The learner was able to run these program independently and requested them often.

c. *Eye Relief*: Although not used extensively with this learner, this program did provide valuable reinforcement in the area of practicing spelling in the context of writing.

d. *STAR*: The earliest levels of the program enabled the learner to further understand important survival vocabulary; however, the level of difficulty, after the very beginning of the program, proved too challenging for a learner functioning at this low a level.